MILL SECTION of Concrete

The Mill Edition of CONCRETE is edited for the manufacturers of portland cement, lime and similar products. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 30 February, 1927 Number 2

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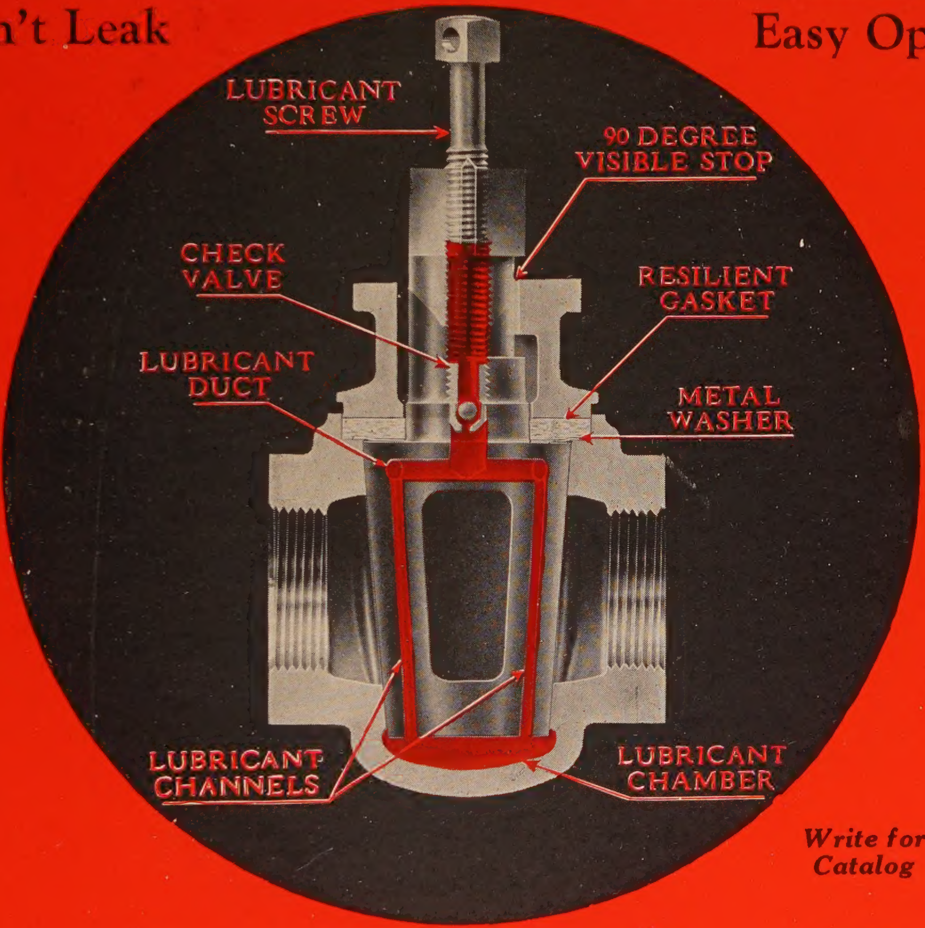

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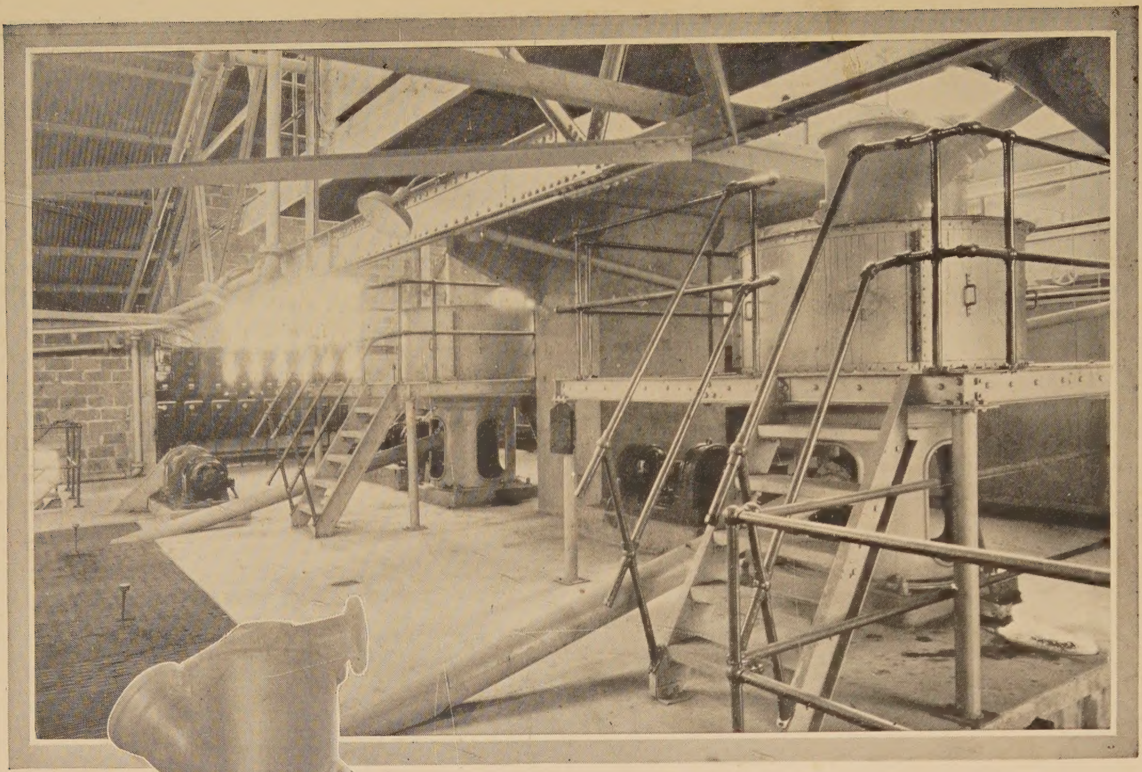

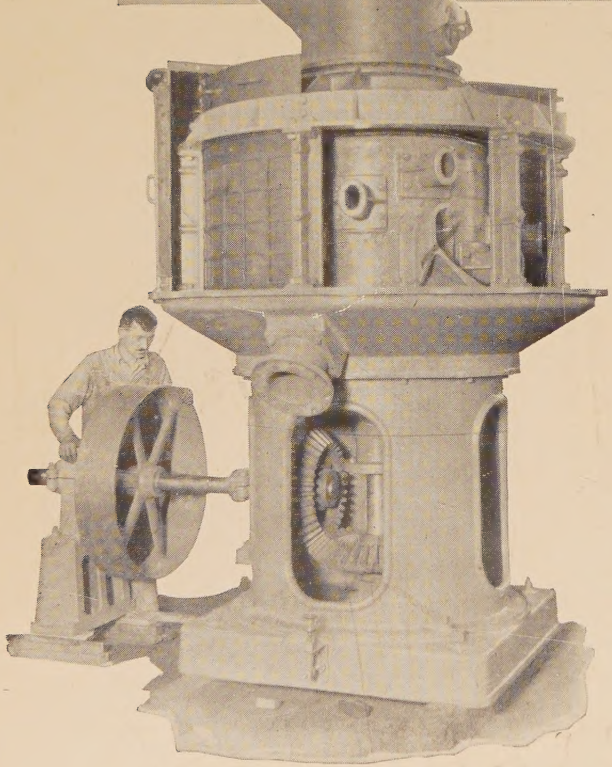

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MILL SECTION of

Concrete

Volume 30 February, 1927 Number 2

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EDITORIALS

Reducing Operating Costs

FEW industries depend upon equipment performance for economical production to the extent that the cement industry does. About $13,000 is invested in plant and equipment for every man employed in the cement industry as against an average of about $5,000 per worker for all American industries.

Naturally, then, equipment design and operation is the primary concern of cement mill operators. Few industries, also, face the constant necessity of replacing old equipment with new that the cement industry does. In almost every mill changes or improvements in equipment installation are constantly under way.

Recent years have seen a constant improvement in cement mill equipment and production methods. In the face of rising costs of labor and raw materials, the industry has been compelled to reduce operating costs to maintain cement prices at their low level.

Many developments have contributed to this end. Among them are the use of electric shovels in quarries; increased length and diameter of kilns; important developments in more compact and efficient grinding machinery; newer methods of cooling clinker; the use of filters to remove part of the water in slurry; waste-heat boiler installations; elimination of transmission belts and line shafts in favor of direct-connected power through speed reducers; improved dust collection; automatic weighing devices; more rugged construction of conveying machinery for the larger raw materials and the use of an entirely new method of conveying powdered raw materials and finished cement.

All of these improvements have helped to reduce operating costs and some of them have helped to increase the uniformity of the product. They have been a part of the necessary struggle for the very existence of the industry. Even now, when the problem of production has a husky rival in the growing problem of sales, there is still the need for still further development in cement mill equipment and methods. Price competition from other materials is as keen as ever.

There are indications of further developments of importance to the cement manufacturer. A cement plant now, as before, is never complete. The manufacturer can never sit back secure in the thought that at last the final improvement has been made, even if he is not confronted with the need to change or improve the quality of his product. He will have to continue to use every advantage that improved equipment and increased man-hour productivity can give him to face the future.

Cement Marketing

THE cement industry is becoming more and more local in character. The shipping radius of the older plants is being narrowed by the encroachment of the newer plants.

Raw materials for cement manufacture are no longer the most important consideration in the selection of locations for new plants. Raw materials for cement manufacture are available in many forms in many locations. More than ever, the economical distribution of the finished product is of greatest importance in the selection of plant locations. Local markets and favorable distribution facilities are of prime importance.

The builders of many of the newer plants such as those near Buffalo, Norfolk, New Orleans, Tampa, Detroit, Rockland, Birmingham, Chattanooga, etc., have sought locations where large local and nearby markets permitted the delivery of a large percentage of their output by truck. In some plants in or near big cities, local truck deliveries constitute the bulk of the shipments.

Some cement manufacturers have gone still further in this plan of truck deliveries. Their plants, besides supplying the nearby city market direct from the storage silos, are located where they can avail themselves of water transportation, thus permitting truck deliveries to other large compact markets in other cities. Storage warehouses, built in the cities that can be reached by water from the plant, have made this possible. Bulk cement, mechanically loaded in boats or barges from the plant, can be transported at low rates to the warehouses in these cities, where it is bagged and delivered direct to the material dealer, the products manufacturer or the contractor. The advantages of such marketing facilities are recognized in many other industries.

In spite of the present widened gap between production capacity and probable sales, several additional new plants are being projected.

By bringing about economies in transportation and distribution, the cost of the material delivered to the consumer will be reduced. Such warehouse systems of distribution have worked out to the advantage of other industries. An extension of these methods in the cement industry may prove helpful.

Unique Quarry Operation of Superior Portland Cement Inc., Concrete, Wash.

Efficient Quarry Located in the Picturesque Cascade Mountains — Electric Shovel Reduces Quarry Costs — Rock Hauled to Plant by Means of Unique Aerial Cable Tramway—A Description of the Plant at Concrete

ONE of the most important of the natural resources near Seattle, and the one which forms the basis for this article, is the mountain of limestone located near the town of Concrete. It is on a bluff of this natural deposit that there has been located by the Superior Portland Cement, Incorporated, the quarry from which is taken daily an average of about 1400 tons of extremely hard rock to be converted into a high grade of portland cement.

The plant of the Superior Portland Cement, Inc., is located in the town of Concrete, which is on a branch of the Great Northern railway, only an hour's ride or so from Seattle. It is in this flourishing village that there has been developed one of the outstanding industries of the Pacific Northwest, modern to the latest degree and employing the most efficient methods of manufacture known to that industry.

Hydro-Electric Development

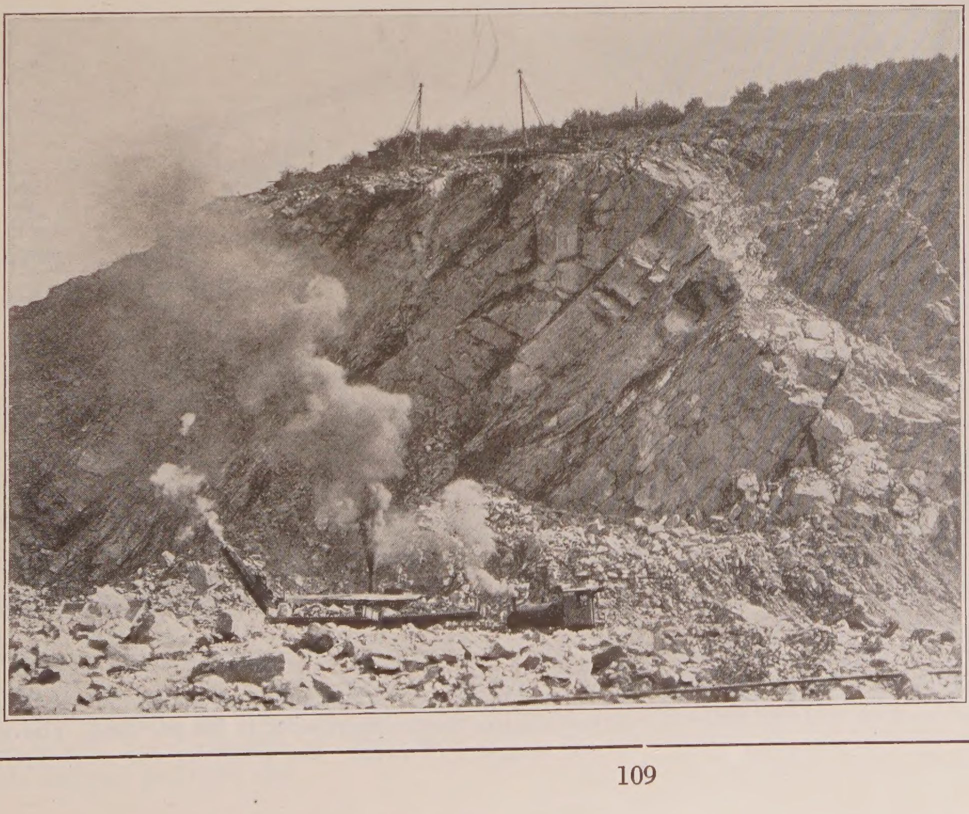
Flanking the town of Concrete is the range of Cascade mountains in the rugged recesses of which lie the sources of two rivers, the Baker and the Skagit. It is at the confluence of these rivers that the town of Concrete is located. On a tributary of these streams, Bear Creek, there has been constructed by the company its own hydro-electric power plant which furnishes current for the operation of the company's cement plant, the daily output of which is now approximately 4700 barrels.

Twelve thousand volts are generated at the company's hydro-electric unit, which is about one-half of the power required for its operations. The current is stepped down at Concrete to 550 volts for mill use. The total requirements of the plant at Concrete are 4500 kilowatts. The outside power is taken from the Baker river hydro-electric development of the Puget Sound Power & Light Co.

The Quarry

One mile distant from the cement plant is the limestone bluff which furnishes the raw material. Its face, as now worked, extends for a distance of 1000 feet and rises to an extreme height of 230 feet with an average of 180 feet. The limestone carries an overburden of earth and debris amounting to 6 feet which is removed by hydraulic pressure.

About 35 feet back from the face of the bluff, holes are drilled to a depth of 8 feet below the quarry floor. These holes are 25 feet apart and have an 8-inch bore. One Armstrong super-electric drill is used. Loading of the holes requires both 60 and 40 per cent Trojan powder. The blast delivers approximately 120,000 tons of rock. When the face has been straightened sufficiently, one shot



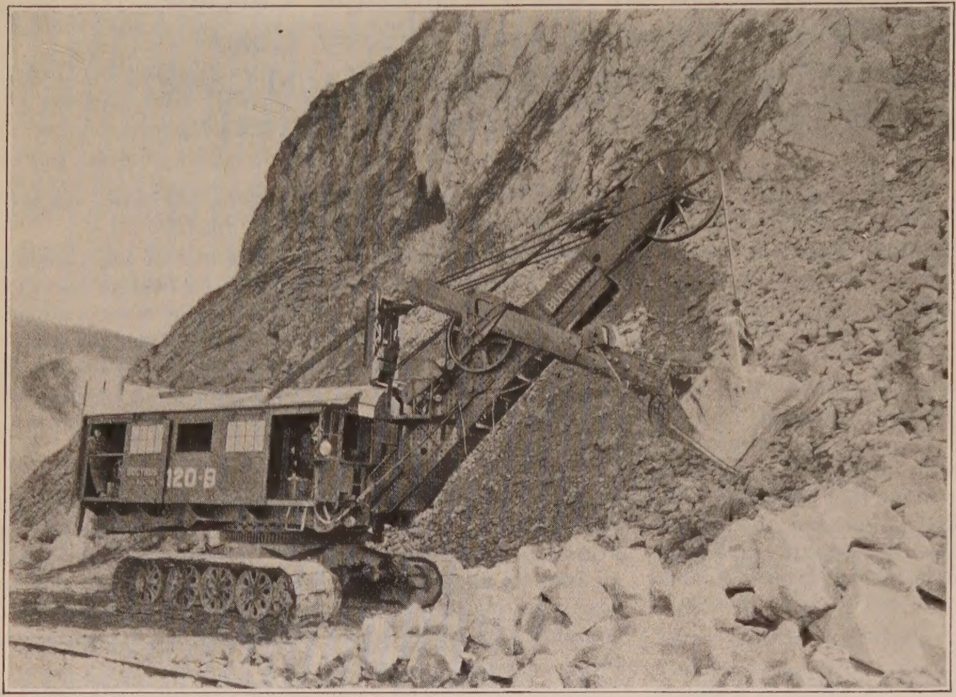
The limestone quarry. The face is 1,000 feet long and rises to an extreme height of 230 feet a year throughout its length will provide the required quantity of rock.

The primary operation of this working is that of loading the rock. There has now been in operation in the quarry for one year a Bucyrus 120-B electric full-revolving quarry and mining shovel, operating on 2200 volts. This machine carries a 4-yard dipper and has a 29½-foot boom and 20-foot dipper handles.

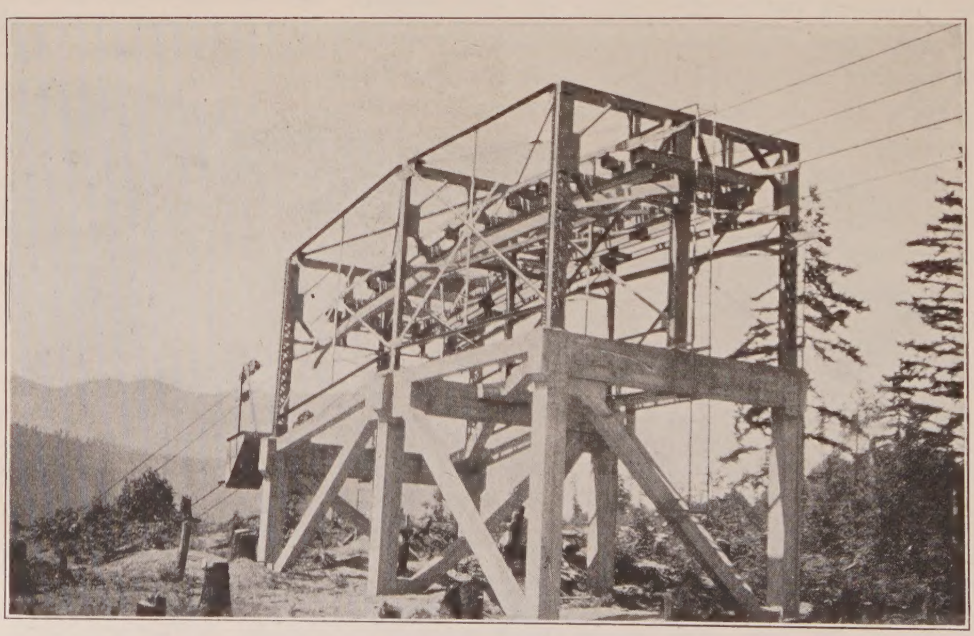
Prior to the beginning of work with this shovel one year ago there were employed two 60-ton railroad-type shovels equipped with 2½-yard dippers which, operating on an eight-hour shift, produced a total of 1100 tons of rock. The electric shovel in the same time produces 1400 tons of rock. While the record with the two machines was 1500 tons the new shovel has made a total of more than 2000 tons on several occasions.

Reduced Quarry Cost

It is the statement of the company officials that the new shovel has reduced the cost of obtaining the rock about 30 per cent. The saving extends further than the production of greater quantities of rock. It saves labor. Two men operate the machine. Only 2 pit men are required. Ten men, in all, are eliminated. A saving in secondary power is also shown, amounting to 50 per cent. The new shovel dipper is 4 yards. The necessity for mud-capping



A Bucyrus 120-B electric full-revolving shovel, carrying a 4-yard dipper, loads an average of 1400 tons of rock per day



One of the reinforced concrete towers supporting the cables that convey the rock from the quarry to the cement plant, a distance of 6,800 feet or pot-holing is greatly reduced. Another consideration is the capacity of the new shovel to overcast rock too large for the dipper. It is placed behind the shovel and drilled for shooting after hours, thereby permitting the shovel to work continuously.

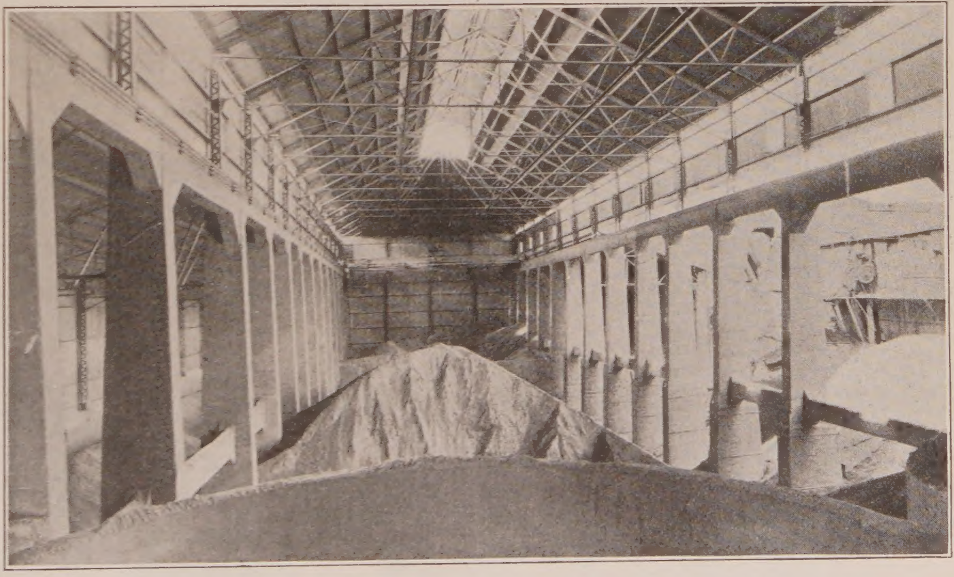
The Bucyrus 120-B works a cut 50 feet wide. It dumps 25 feet from the center of the operation in an arc 60 to 180 degrees. Its caterpillar traction permits ready handling. At quitting time it is moved 100 feet from the face of the cliff to avoid possible damage from slides, which operation requires 30 minutes daily to move in and out. Serious damage was done on several occasions previously to the railroad-type shovels because they stood at the face of the quarry.

Showing the type of country through which the cable line operates

The shovel loads into 12-yard Western dump cars which are moved in trains of 2 and 3 cars. A 30-ton American and 20-ton Davenport locomotive furnish power.

Handling the Rock

The cars from the shovel dump into a 42-inch Traylor Bull Dog gyratory crusher below track level. The material is broken to 8-inch size and delivered by bucket elevator to bins above No. 4 and No. 6 Allis-Chalmers Gates crushers, 2 of each, fed by four Sheridan feeders. From the crushers the material is delivered on a 30-inch belt conveyor 350 feet to the top of the aerial tramway terminal bin, which has a capacity of 700 tons. It has by now been reduced to 3-inch size.



Inside of clinker storage where the material is handled by a 3-yard clamshell bucket

Aerial Tramway

More than a mile of aerial tramway mounted on concrete towers is used to carry this material to the cement mill. The tramway is 6,800 feet in length, with cable spans 1,100 feet from tower to tower. It has a capacity of 250 tons per hour, operated by gravity, although controlled by a 30-hp. motor, and is believed by company officials to be one of the largest in operation and the only one supported by concrete towers.

The tram buckets have a capacity of 1½ tons and there are 80 of them on the line. The material is loaded by air-controlled gates. The buckets are conveyed loaded on 1⅝-inch cable and returned on 1-inch cable. The drive cable which moves the buckets is a 1-inch line. The lines are lock coil cable supplied by the American Steel & Wire Company, which company is also the designer of the conveyor and supervised its installation.

The equipment housed with the crusher at the terminal end of the tram includes a laboratory for rock testing. These tests are taken hourly, and are for the purpose of allocating the rock to the various storages. Two Ingersoll-Rand 14 x 12 air compressors are located in this building. They furnish pressure for operation of the tram-loading gates and the quarry drills. Motors in the crushing plant vary in capacity up to 250 hp. They include Allis-Chalmers, Bullock, and General Electric, while the shovel in the quarry is powered by General Electric motors.

Open storage, allowing a pile 80 feet wide, 250 feet long, and 50 feet high is provided at the mill end of the tram. The capacity is over 100,000 tons. Rock from the storage is handled by an 11-foot Shepard overhead traveling crane operating a 4-yard Blaw-Knox bucket.

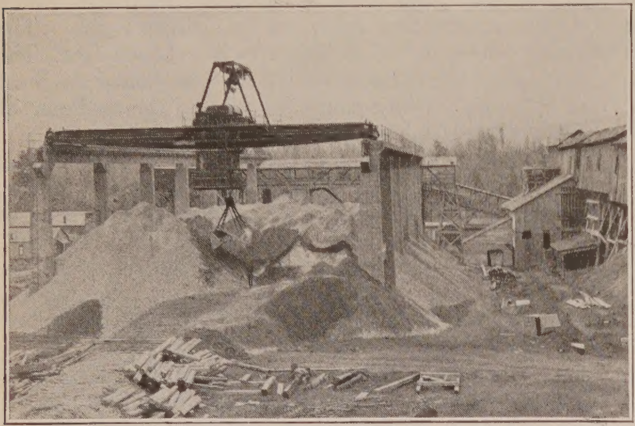
Clay for the cement mill is procured from a pit one-half mile from the plant. It is excavated by a derrick operating with a clamshell bucket. Kenworth trucks of 5-ton capacity transport the material.

The Cement Plant

The plant of the Superior Portland Cement, Inc., is considered one of the most modern. Tracing, briefly, its operations from the rock storage bins, 2 gear-driven Bradley Hercules mills grind the stone to allow 70 per cent to pass through 20-mesh and 40 per cent through 200-mesh screens.

The clay is washed, reduced to a slurry, and added to the limestone in the mills. The water carrying the clay and limestone in suspension is pumped with a Wilfley 4-inch pump to a storage trough and then passed through a battery of 6 tube mills. From these mills the solution passes to 7 tanks, thence to an eighth tank for the kiln feed.

There are 6 kilns for producing clinker. Three measure 8 x 7 x 135 feet and three 9 x 8 x 192 feet. The capacity of the kilns is 4,700 barrels of clinker in 24 hours. From storage the clinker and an admixture of gypsum, handled by an overhead crane, is fed to 2 Hercules mills, given preliminary grinding, and thence into 7 Allis-Chalmers tube mills, where it is reduced to powder. This grinding equipment has a capacity of 7,000 barrels of cement a day.



Outside storage of crushed limestone at the cement plant

The cement is stored in 15 reinforced concrete silos with a total capacity of 100,000 barrels. Conveyors pass the material to a power house where 6 Bates packers equipped with Cyclone dust collectors are capable of packing and loading 2 cars of cement an hour. Coal for the operation is procured from Bellingham, transported by way of the Great Northern Railway.

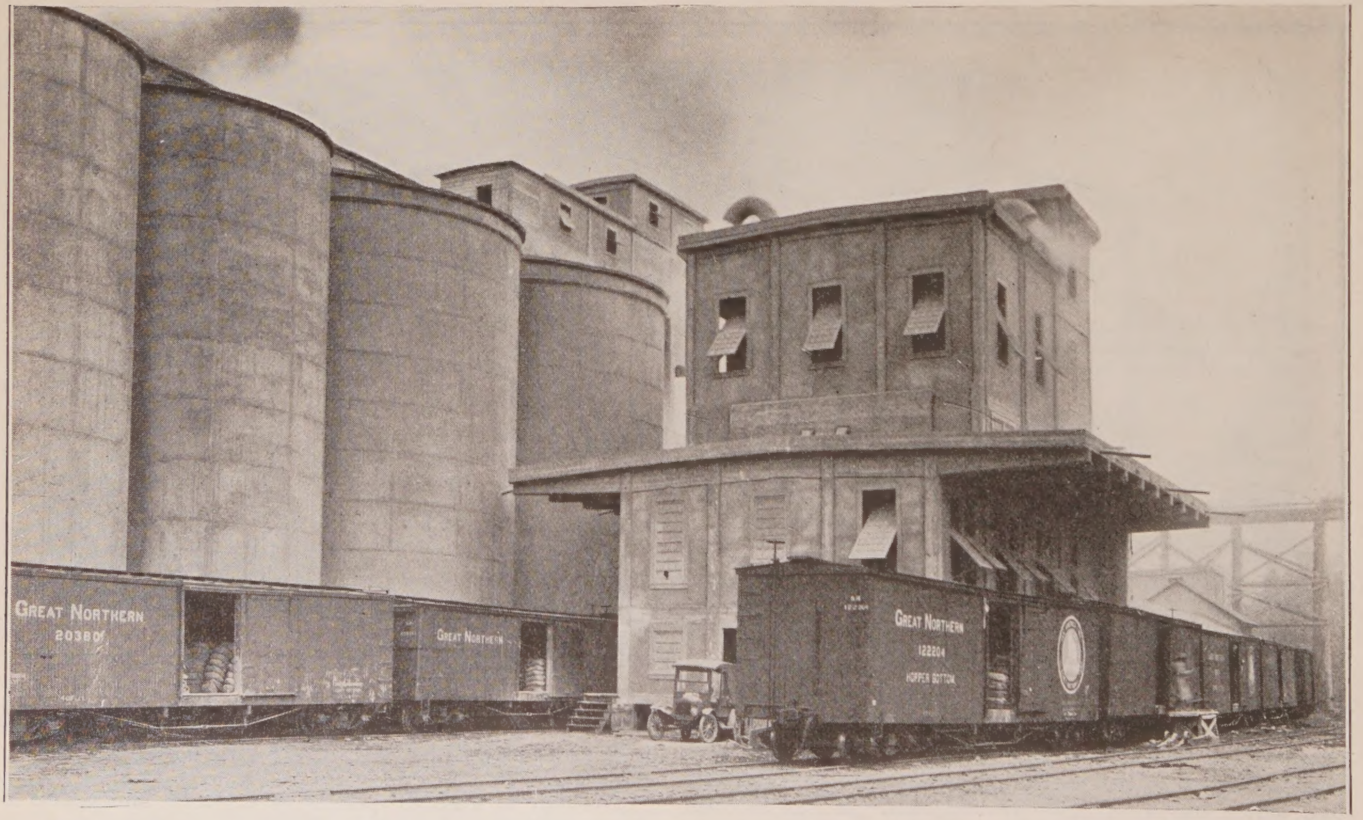
Incidental to the operation of the company's quarry and mill, but necessary to plant administration and efficient management, are the accessories maintained. They include a complete machine shop housed in a reinforced concrete building. The company offices are located in a concrete building, in the basement of which is a laboratory equipped with an experimental manufacturing plant and machines for breaking and testing of samples.

Cement Importations

"Cement manufacturers of the country are facing problems other than plant operation efficiency," says C. N. Reitze, vice-president and general manager of the Superior Portland Cement Corporation, in commenting on the general situation now obtaining. "There is coming into this country from abroad a considerable quantity of foreign-made cement. This product, generally inferior in quality and sometimes even unsafe for use, enters the home market at a figure designed to attract the unthinking consumer.

"For the first half of 1926, January to August, there were imported 2,234,803 barrels of foreign cement. This influx of the foreign material directly affects the American manufacturer. In addition it indirectly affects all those industries that produce equipment and materials and service required by the American cement manufacturer. All industry and business suffers as a result, and not infrequently a construction project utilizing foreign-made cement becomes a public menace. American consumers should specify American-made cement, and thereby aid American industry and American workmen, and safeguard the American public," he declares.

Headquarters of the Superior Portland Cement Corporation are in Seattle, Washington, Seaboard Building. John C. Eden is president, C. N. Reitze, vice-president and general manager, Gordon Tongue, treasurer and sales manager, George L. Dickinson, secretary, and C. L. Wagner, general superintendent at the plant in Concrete.



Reinforced concrete silos and packer house at the cement plant of the Superior Portland Cement, Inc., at Concrete, Washington

Power Plant and Kiln Design and Operation

A Series of Articles on the Combined Processes of Power Plant and Kiln Operation, Considered as a Unit

By R. R. COGHLAN
Chemical Engineer
AND
T. H. ARNOLD
Electrical Engineer, Southwestern Portland Cement Co., Osborn, Ohio

Chapter V.—Coal and Its Preparation

This article, setting forth fundamental considerations in the selection, chemical composition, preparation and use of powdered coal in cement plants, is presented as an introduction to succeeding articles which will discuss calculations of combustion in kilns, types of coal used, mechanics of combustion of pulverized coal, ash content, heat transfer in the burning zone, and coal dust prevention.

THE present successful utilization of powdered coal as a fuel has grown through gradual development from rather indifferent results in the early experiments. The possibilities of this method of using fine coal were realized early in the nineteenth century and patents for coal dust burners were taken out in this country as early as 1866. There do not appear to have been any successful results commercially till Hurry and Seamon developed its use with the rotary kiln in 1895. For a number of years the cement industry was practically alone in the use of pulverized coal. With improvement in methods and better appreciation of its possibilities, this type of fuel was gradually applied to metallurgical furnaces and later to steam boilers. This fact is interesting in that the early experiments were conducted on steam boilers and metallurgical furnaces. It required the experiments on the rotary kiln, however, to develop the principles whereby it could be applied to the other types of furnaces.

Difficulties Encountered

The failure of the early experiments was largely due to a lack of appreciation of the underlying principles necessary for the proper combustion and successful utilization of pulverized fuel. A review of the various causes which interfered with the success of these early experiments will reveal the fact that many of these same causes are giving trouble today. The importance of fine grinding and uniform sizing of the fuel is not always appreciated even in the light of modern experience. The design and arrangement of the fans, burners, and air piping in many installations show a surprising lack of attention to the laws of flow of gases. The necessity for an intimate mixture of the air and coal, the influence of velocity in maintaining the coal in suspension and the advantage of turbulent flow at burner tip have been overlooked in many cases. Attempts have been made to burn more fuel than the volume of the combustion space would permit. It is not generally realized that combustion even with pulverized coal is not instantaneous but requires an appreciable time. Many disappointing results could have been avoided by applying study to these points.

The comparative ease with which pulverized coal may be floated in an air stream has brought forth numerous designs of coal burners which have met with varying degrees of success. The essential requirements of a successful burner are simple. There must be a uniform feed of fuel with suitable means of regulating the quantity of fuel and air. The fuel and air must be thoroughly mixed and the mixture introduced into the combustion chamber with sufficient velocity to carry it clear of the burner tip and produce a turbulent flow in the combustion space.

Of these requirements, the most difficult is the assurance of a uniform flow of fuel. Flushing and stoppage of flow are probably allied and result from temporary bridging of the coal in the hopper followed by a rush of material when the bridge drops. If the feeder is not properly designed the material will flush through and more coal will be fed than can be properly consumed. Such irregularities in feeding must be rectified before economical conditions can be attained.

Types of Coal Used

It has generally been considered desirable to use a high quality of coal for burning portland cement. Coal for this purpose is usually selected on the basis of a high B.t.u. value, low ash, and high volatile content. Coals of this type have been generally available at reasonable prices and the solution of other problems incident to manufacturing have occupied the time of the operating forces in the majority of plants. The development and use of the lower grades of coal have thus been relegated to those plants unfavorably located with respect to fuel supply.

Careful study of the problem has enabled some unfavorably located plants to utilize the lower grades of coal with resulting fuel economies which compare favorably with plants using the higher grades of coal. The calorimeter value of the heat content of the coal may be deceptive regarding the heat available under kiln conditions. With a high hydrogen content, the latent heat of the water vapor formed in combustion robs the fuel of a considerable portion of the heat indicated by the calorimeter. The vapor thus formed must also be brought to the flame temperature. The heat absorbed will result in a reduction of flame temperature. Moisture introduced with the air or coal will have a similar result. It is thus essential that the coal carry a minimum of moisture as fired.

Coal Drying

The heat expended for drying the coal in the dryer will result in greater efficiency as the moisture will be removed and discharged at a lower temperature and thus require less heat units than if allowed to enter the kiln. The drying of the coal will also affect the grinding efficiency of the coal mills, thus drying should be carried as far as commercially possible with the coal in question. It is generally possible to remove the entrained water to 0.5 per cent or less. Combined water will not interfere with grinding operations and cannot be readily removed.

A wide variety of equipment is available for this purpose and the particular type selected should depend upon the conditions obtaining at the plant in question. A number of forms of rotary dryers which use indirect heat from coal burned in the dryers have been developed. Stationary dryers in which hot air or the products of combustion are passed through a descending stream of coal will give satisfactory results where such hot gases are available. Drying of this type depends more upon the evaporative effect of the hot, dry gases than upon the heat to remove the moisture. The temperatures of both coal and gases will thus be lower than in the rotary types. The fuel saving will be an appreciable item where waste heat is available. A third form utilizes low-pressure steam to heat the coal and drive off the moisture by the application of heat alone. Any of these methods will remove the moisture and produce a satisfactory product if properly installed and operated. The particular type selected will depend upon which will accomplish the desired results at the lowest cost under the conditions prevalent at the particular plant.

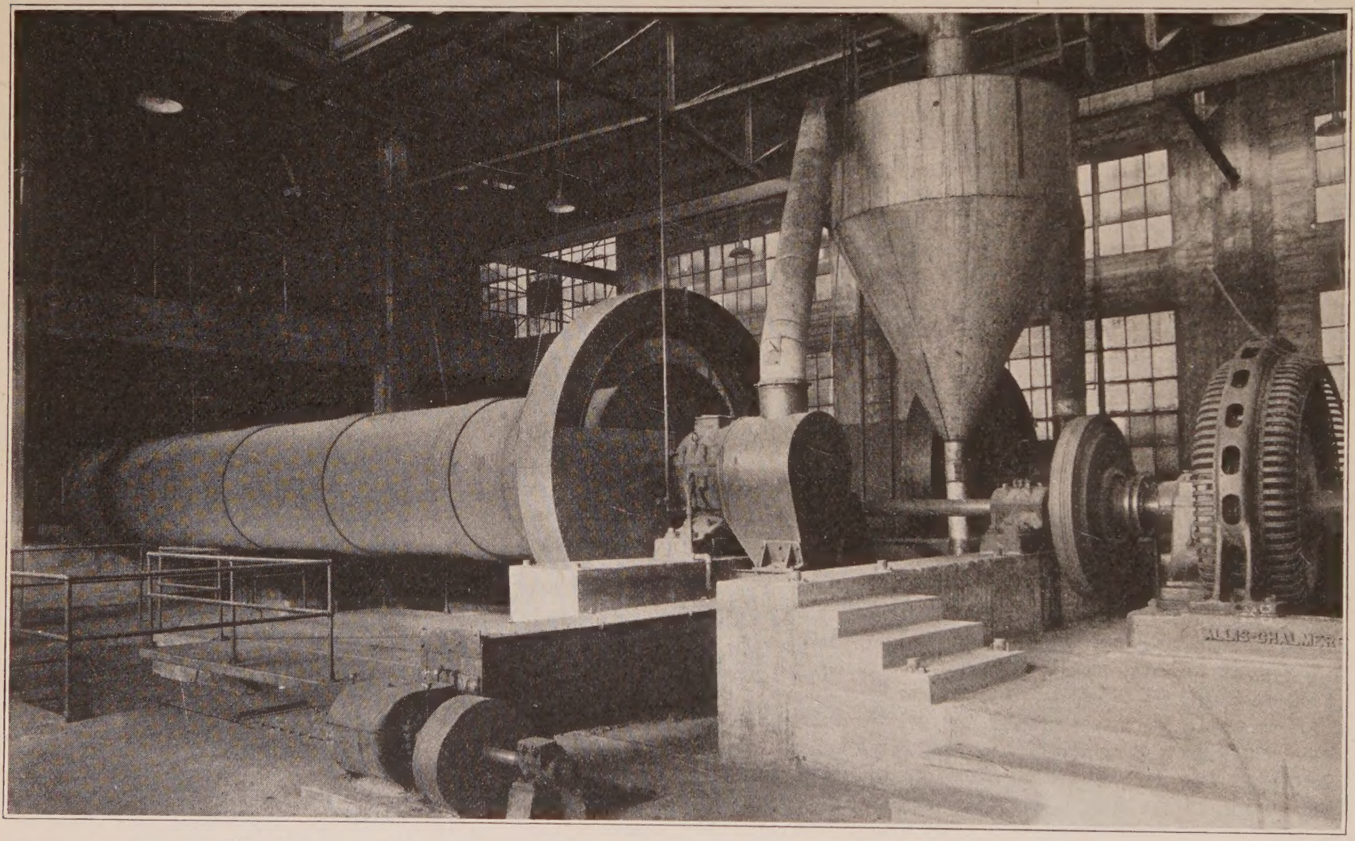
Mechanics of Combustion of Pulverized Coal

The underlying theory of pulverizing coal for combustion is that the increased area available for the chemical reaction between the carbon and oxygen will speed up the reaction and will result in a more intimate mixture, which permits perfect combustion with less excess oxygen. Combustion is carried on by the combination of successive molecular layers of carbon with the oxygen content in the envelop of gases till the process is carried to the center of the particle. Turbulence is necessary in the gases to remove the carbon dioxide formed and renew the oxygen supply in proximity with the carbon particle.

The effect of fineness upon the area exposed to combustion is illustrated by considering the area of a 1-inch cube which is 6 square inches. If the material in this cube were reduced to particles 1/200 inch in diameter, the total area of all the particles will be more than 8 square feet. This enormous increase in the area exposed will result in more rapid absorption and radiation of heat to produce combination with oxygen in combustion, thus vastly increasing the speed of the reaction. If the coal could be ground to molecular proportions and mixed with an adequate amount of air, combustion would be instantaneous and the fuel would be consumed at the burner tip. This is not desirable and such fineness of the coal would be unduly expensive. In burning cement it is desirable to have a flame of considerable length.

The volatile matter will distill before the coal will reach the temperature necessary for ignition of the carbon. The removal of the volatile content leaves a more or less porous mass which increases the effective area of the residual carbon and ash. Thus the percentage of volatile matter in the coal will have some effect upon the desirable fineness of the coal.

The length of the flame will depend upon the time required for the combustion of the coal particles, the velocity with which the gases pass through the burning zone, the temperature and percentage of primary and sec-



The coal room at the Osborn (Ohio) plant of the Southwestern Portland Cement Company ondary air, the turbulence of the gases in the flame and the temperature of the furnace walls. If a particle is not consumed in the burning zone, it will probably pass on through the kiln unconsumed. This is evidenced by the carbon particles found in the dust from the flues and boilers.

Ash

The ash content has always been considered a detriment to any fuel. It carries the same freight and handling costs as the combustible materials and is responsible for the larger portion of the grinding costs. As a certain proportion of this ash is absorbed and combines with the clinker, the chemical composition of the ash must be considered in its effect upon the quality of the resulting cement. As the percentage of ash in the coal increases the amount of the contamination of the clinker becomes correspondingly greater. The composition of the ash is usually similar to some of the constituents of the raw material. Where adjustments of the raw material may be made to compensate for the ash, the contamination becomes of value proportional to the cost of the material it replaces.

The process of heat transfer in the burning zone of the rotary kiln is largely by radiation. If we conceive a kiln with a colorless flame such as the oxy-acetylene, the radiating qualities will be low and, while the gases will introduce a high heat content, little heat will be transmitted to the material in the burning zone. The greater portion of this heat would be carried out the back end of the kiln with the gases and no clinker would be burned unless the gases were made to impinge on the material. In the ordinary coal flame, the carbon and ash particles become incandescent and radiate the heat to the materials. An oil or gas flame has only the radiation from the flaming carbon particles and this fact will probably account for the higher heat per barrel required when burning with gas or oil.

This rapid transfer of heat in the burning zone is necessary to obtain high fuel efficiency in the kiln. The heat transfer from the incandescent ash particles is evidently greater than from the carbon alone. A high ash content may thus be of benefit in obtaining higher fuel economy with the lower grades of fuel, if properly handled. The underlying principles of this method of heat transfer appear to have been recognized by Leslie a number of years ago when he proposed to introduce a portion of the raw material with the fuel. A comparatively small percentage of the raw material can be introduced in this manner and considerable complications will be introduced in the maintenance of proper proportions of materials.

Heat Transfer in the Burning Zone

The various changes in the composition of the material passing through the kiln are accomplished by the application of definite quantities of heat per pound of material at each stage. Each process, however, requires a definite minimum temperature of material below which it cannot be complete. Each process requires a higher temperature than the preceding one. Thus only the heat content of the gases above the temperature necessary for the process will be of benefit in any zone of the kiln.

A high heat transfer rate is essential to high fuel efficiency in all zones of the kiln. Three factors are necessary for obtaining this high heat transfer rate. The flame or gas temperature must be as high as possible, the flame must be of a type which will readily radiate its heat, and there must be sufficient material in the various zones to absorb the heat.

Heat transfer by radiation will vary with the fourth power of the absolute temperature of the flame and the absorbing surface. This follows the Stefan-Boltzman Law and is expressed mathematically in English units by the formula:

$$Q = ESC\left[\left(\frac{T_2}{100}\right)^4 - \left(\frac{T_1}{100}\right)^4\right]$$

Where Q = the quantity of heat transmitted in B.t.u. per hour.
E = the relative radiating power (black body coefficient) of the absorbing surface.
S = the area of the absorbing surface in square feet.
C = 0.162.
T_2 = the absolute temperature of the flame in deg. F.
T_1 = the absolute temperature of the absorbing surface in deg. F.

To illustrate the importance of a comparatively slight increase in the flame temperature, assume a clinkering temperature of 2500 deg. F. and flame temperatures of 2800 and 3000 deg. F.

At 2800 deg. F.—

$$Q = ES \times .162\left[\left(\frac{2800+460}{100}\right)^4 - \left(\frac{2500+460}{100}\right)^4\right]$$
$$= ES \times .162\ (1{,}129{,}460 - 767{,}656) = ES \times .162 \times 361{,}804$$

At 3000 deg. F.—

$$Q = ES \times .162\left[\left(\frac{3000+460}{100}\right)^4 - \left(\frac{2500+460}{100}\right)^4\right]$$
$$= ES \times .162\ (1{,}433{,}192 - 767{,}656) = ES \times .162 \times 665{,}536$$

The quantity of heat transferred at 3000 deg. F. as compared with that at 2800 deg. F. will then be as the ratio:

$$\frac{665{,}536}{361{,}804} = 1.8394$$

or the increase of 200 deg. F. in the flame temperature will give an increase of 84 per cent in the heat transmitted by radiation in this case.

The two factors which commonly militate toward low flame temperatures are moisture and excess air. The advisability of removing moisture has been briefly covered, the control of the excess air is equally important. Herrington (Powdered Coal as a Fuel) gives the following table of temperatures attained from the combustion of pure carbon with varying amounts of excess air.

1 lb. carbon with	11.6 lb. air	(normal)	3990 deg. F.
1 " " "	12.76 " "	(10% excess)	3747 "
1 " " "	13.92 " "	(20 ")	3526 "
1 " " "	15.08 " "	(30 ")	3333 "
1 " " "	16.24 " "	(40 ")	3153 "
1 " " "	17.40 " "	(50 ")	3002 "
1 " " "	18.56 " "	(60 ")	2849 "
1 " " "	19.72 " "	(70 ")	2725 "
1 " " "	20.88 " "	(80 ")	2509 "
1 " " "	22.04 " "	(90 ")	2447 "
1 " " "	23.20 " "	(100 ")	2345 "

Commercial fuels will give somewhat different temperatures but the general relationship with varying amounts of excess air will be similar.

Dust Prevention

One of the remarkable results of the close engineering study applied to the preparation and use of pulverized fuel has been the elimination of the escaping dust in many of the recent mills. For many years the designing engineers and plant operators have refused to accept the safety and economy incident to the prevention of the escape of coal dust from the conveyors, grinding mills, and other equipment in the coal mill.

Four elements of waste have been prevalent. The fuel value of the material lost, while quite large, is one of the smaller items. The amount of material lost is seldom appreciated till efforts are made toward its recovery. Invariably the quantity recovered is greater than the original estimates of material lost.

The reduction in labor, supplies, and time lost in making repairs in the newer plants where dust is minimized is a revelation to the operator from one of the older plants. As an example, some of the older mills give an average life of motor bearings as 6 to 9 months, while some of the recent mills do not replace 1 per cent of their motor bearings in that time. A portion of this may be traced to better maintenance but the general plant repairs will be in about the same proportions. Some of the modern equipment which promotes operating efficiency and decreased cost cannot be used where subject to severe dust conditions. The reduction in the repair cost and the increased continuity in operations are larger factors in the collection of dust than the value of the materials recovered.

When the plant is designed for convenience in operation and is maintained in a clean condition, the labor turnover will be small, with a corresponding increase in operating efficiency. Such a plant can usually obtain the pick of the available labor in the district. This condition is being recognized by plant executives in all industries. The cement industry, in common with others, will benefit from this factor.

The largest single benefit derived from the prevention of the escape of coal dust lies in the reduction of a serious hazard to workmen which has demanded a heavy penalty from the cement industry in deaths and in maimed employees. There is little danger from fires in the bins and conveyors so long as the coal is kept in motion and air is excluded. Experienced cement mill operators are familiar with such fires and the methods for handling them. The contingency which is to be dreaded is the fire in an atmosphere filled with a dense cloud of coal dust.

The only satisfactory method of dust prevention is to stop the dust at its source. Once it escapes to the atmosphere collection is difficult and expensive. The maintenance of a slight vacuum with proper vents at suitable points to dust-collecting apparatus will prevent the escape of the dust. If carefully designed to fit the conditions, and properly operated, the value of the material recovered will frequently justify the expenditure.

The past few years have witnessed encouraging progress in mitigating these conditions and present tendencies are toward still greater efforts in those plants where experiments have been conducted along these lines. The intangible unevaluated benefits have been found to be of far greater value than those which may be directly translated to dollars.

Conclusions

An intensive and continuous study of the engineering and economic features of fuel, fuel handling, combustion, and heat utilization is highly desirable in each plant of an industry which consumes the quantity of fuel used in the manufacture of portland cement. Possible savings through fuel economies in quantity or grade may easily run in the neighborhood of 5 to 10 cents per barrel of finished cement.

Conservation of our national fuel resources would indicate that careful study should be given the problem of utilizing the lower grades of coal and releasing the higher grades for other uses. This would enable the use of much material which is now mine waste, with a consequent lowering of the fuel cost. Where the high grades are used, closer attention should be given to fuel economies. The resulting savings may be passed on to the consumer in the form of increased quality or a lower price for the present standard portland cement.

(Part VI of this series will be published in the March issue.)

Hazard of Missed Holes in Blasting Told

Drilling or picking into missed holes is one of the most frequent causes of blasting accidents in metal mines, states E. D. Gardner, mining engineer, Bureau of Mines, in a recently issued publication. When it is known that a face contains an unexploded charge the hazard is greatly reduced, as before anyone does any other work at the face the missed hole can be reblasted by placing a new primer above the charge.

To count the detonation of shots in rounds and to report the missed holes is an almost universal practice. Occasionally, as in a large stope where a number of rounds are shot together, it is not practicable or possible to count the individual shots.

Where "V"-cut rounds are used, two or more charges often explode together and in consequence there is doubt as to whether any misfires have occurred. Under these conditions miners are more likely to pick or drill into missed holes in cleaning out the broken material.

Missed holes in drift rounds are usually easy to detect by an inspection of the face, and are generally identified by the fuse sticking from the hole. Missed lifters in drift rounds are sometimes not made evident by an inspection, and for this reason are more dangerous. Most miners load the lifters heavily so that the broken rock will be thrown back from the face on a shoveling sheet; this makes the detection of a misfire in a lifter easier. Missed holes in shafts or in underhand stopes are more hazardous than those in drifts because the unexploded charges are harder to find.

New York Power Show Has Comprehensive Displays

Strides of progress throughout the entire field were noted at the fifth National Exposition of Power and Mechanical Engineering in New York in December. In power generation, many novelties in the design of boilers were shown. In the development of refractories, in the adaptation of valves and fittings for high pressure operation, and in the revision of several new methods of control for boiler plant operation, much newly developed material was exhibited.

Electrically, hydraulically, and pneumatically operated valves, pulverizers, fuel burners, steam superheater elements, measuring and recording devices, condensers, and air motors were but a few of the devices shown by the 190 exhibitors.

Chicago Power Show in February

Plans have been completed for the Chicago Power show to be known as the Midwestern Engineering and Power Exposition at the Coliseum, February 15 to 19.

A. S. M. E. Making Plans for 1927 Meetings

The American Society of Mechanical Engineers is making plans for the mid-west regional meeting to be held on April 4, 5 and 6 at Kansas City, Mo. The technical program will treat of the important engineering problems of that section.

Two of England's Modern Cement Plants

A Detailed Description of the Methods and Equipment Used in Two of England's Newest Cement Plants—History of Cement Manufacture in England—Remodeling the Bevans Works of the Associated Portland Cement Manufacturers, Ltd.—A Description of the New Kent Works—Pump Raw Materials from Pit to Plant

By A. C. BLACKALL

Part II

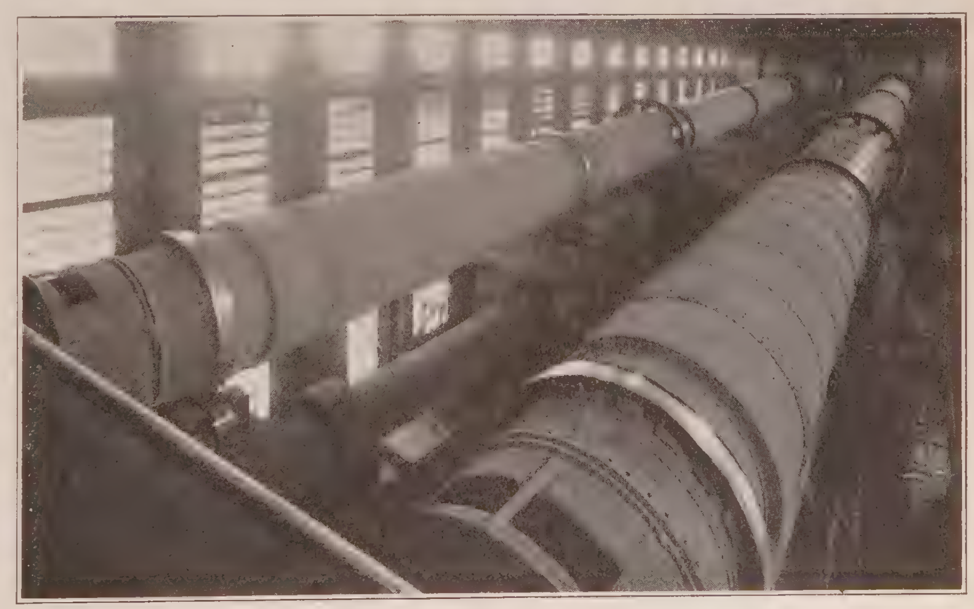
(Concluded from the January Issue)

Kilns

The rotary kiln, which is the most modern calcining plant, is, like portland cement itself, an English invention. Patents were first taken out for it by the late Frederick Ransome and others many years ago. The kilns with which Ransome experimented at one of the works of the Associated Portland Cement Manufacturers were not more than 25 or 30 feet in length and from 3 feet 6 inches to 5 feet in diameter. They were heated by producer gas, and no attempt was made to pump the liquid slurry into the rotating furnace, as is now done. On the contrary, it was first dried and coarsely pulverized. This then-supposed necessity for first drying and crushing the slurry and the inadequacy of the heating arrangements by producer gas prevented the immediate adoption of the rotary kiln in the United Kingdom. Different raw materials and the "dry" system of manufacture employed by cement makers in Pennsylvania, however, led American engineers to take up Ransome's idea, improve upon it, and convert it into a success. The length and diameter of the kilns were greatly increased, and crude petroleum or pulverized coal was employed as fuel. As a result, the rotary kiln today is the standard system throughout the portland cement industry all over the world.

The coal used is dried in rotary dryers—one, enclosed and concealed, is 52 feet 6 inches in length by 5 feet 3 inches in diameter. The other is fully exposed, is 71 feet in length and 8 feet 6 inches in diameter. The latter dryer makes two revolutions per minute. The coal is ground into a coarse powder in a mill consisting of a revolving cylinder 37 feet in length by 6 feet in diameter, divided into compartments containing charges of steel balls and pellets. This powdered coal is then injected into the firing end of the kilns through a nozzle by means of an air blast generated by a high pressure fan.

The two rotary kilns at the Kent Works (as illustrated) are each 245 feet in length, 11 feet in diameter in the burning zone, which is 47 feet long, and 10 feet in diameter for the remainder of their length. Here the visitor has driven home to him more forcibly than at any other part of the works the radical change and advance which has been made in manufacturing methods. The old type of intermittent kilns made a preliminary drying of the slurry necessary, and this was usually carried out upon a floor



The kilns at the Kent works are 245 ft. long, 11 ft. in diameter in the burning zone, which is 47 ft. long, and 10 ft. in diameter for the remaining length or in chambers heated by the waste hot gases from the kiln. The dried slurry (in rough lumps) was then transferred to the kiln, in which alternate layers of coke and slurry were built up until full. The kiln was then lighted and as a rule took four or five days to burn off. When sufficiently cool the clinker was drawn from the kiln and conveyed by trucks or barrows to the grinding mills.

With the modern rotary kiln process, however, the liquid slurry is pumped direct into the upper end of the kiln, the feed being regulated by a special arrangement under the control of the operator in charge of the kiln. The material passes from one end of the kiln to the other and is first dried, and upon reaching the zone of heat at the lower or firing end, it is calcined at a temperature of about 2,800 degrees Fahrenheit.

Close Supervision of Burning

The entire process of burning in the rotary kiln is under the absolute control of the man in charge. He can regulate the quantity of slurry entering the kiln, the amount of fuel (pulverized coal) being injected to maintain the necessary temperature for calcination at the lower end, and the speed of rotation of the kiln—which latter governs the output—the calcined clinker subsequently leaving the kiln in a stream of small pieces uniformly burnt and in which any variation of hardness would be easily detected and immediately rectified. Each kiln at Kent Works consumes approximately 5 tons of coal and produces about 14 tons of clinker per hour. One other important improvement secured by the rotary kiln method of manufacture is the exclusion of practically all the ash of the fuel from the cement—a persistent source of contamination in the clinker produced in the old intermittent kilns.

The two reinforced concrete chimney-stacks to these kilns are each 230 feet high and 11 feet 2 inches in diameter. The bases of the chimney-stacks are enlarged to form dust-collecting chambers.

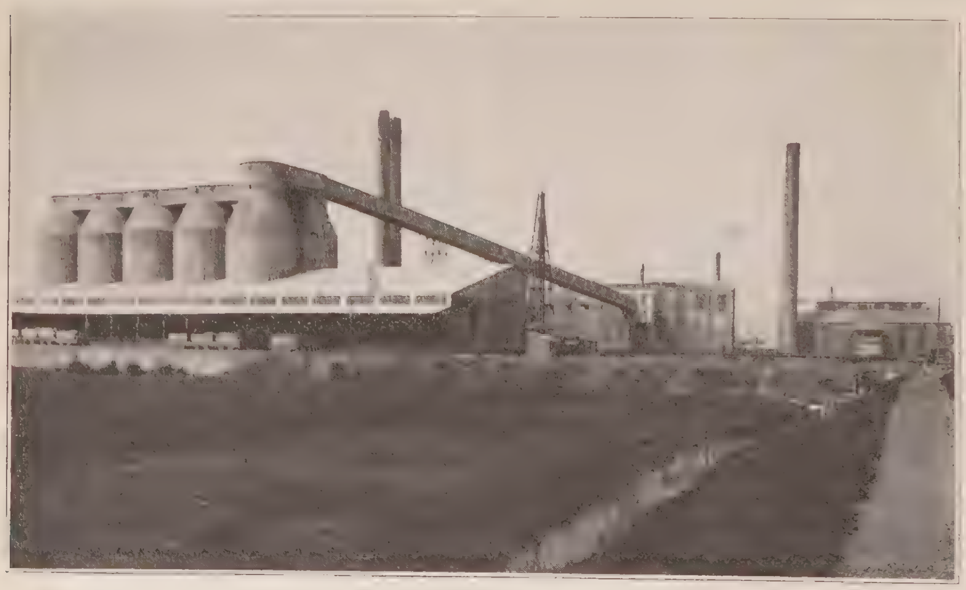
Handling Clinker

Upon leaving the kilns the hot clinker passes through rotary coolers, each 68 feet in length and 5 feet 6 inches in diameter. Here the heat is extracted by means of air blown in by a large fan, and the heated air passes on to the kiln for the combustion of the coal. The cool clinker is delivered to shaker conveyors, which in turn deliver to chain buckets which tip the clinker into a reinforced concrete hopper of 11,000 long tons capacity. A large stock of clinker is always carried in order to secure absolute uniformity of product. The elaborate clinker-conveying system provides for the new clinker just made being tipped *on top* of the heap in storage. In its circular process, the bucket conveyor afterwards picks up the cold clinker from *the bottom* of the heap and transports it to the grinding mill hoppers.

Filling cement sacks for shipment

Finish Grinding

The economical grinding of portland cement clinker has



Cement storage at the Kent works. There are 10 silos, each with a capacity of 1750 long tons received much investigation of late years in Britain. Many inventors have developed numerous mills of various types. At the works being described the machinery is of the most modern type, consisting of four mills, each divided into compartments containing steel balls and pellets weighing from 20 to 24 tons. These mills are 37 feet in length and 6 feet in diameter and each requires approximately 300 horsepower for driving. This is, of course, one of the most costly and important parts of the manufacturing process, the cost of grinding being in direct ratio to the fineness. The finer the powder (and consequently the better and more valuable the cement) the greater the cost to the manufacturer. The grinding mills at this works are engaged in reducing the clinker to such extreme fineness that from 93 to 95 per cent of the finished cement will pass through a sieve having 32,400 holes per square inch. During the grinding of the cement the regulation of the setting time is effected by the addition of small quantities of gypsum. Continuous rubber conveyor belts convey the ground cement at the rate of 36 tons per hour to ten reinforced concrete silos (see illustration), each of 1,750 tons capacity. The cement is extracted from these silos and filled into sacks of the correct weight by vacuum machines, of which there are six (see illustration).

Power Plant

A great amount of power is required for operating the plant's heavy machinery. The power unit is a steam turbine operating electric generators of 3,000 kilowatts capacity (see illustration). There are two of these turbines and they are run alternately. A small Diesel oil engine is operated for the purpose of lighting when the plant is down for overhaul. Two Thompson and one Babcock boilers provide steam, supplying 20,000 pounds evaporation per hour each. They are fitted with all modern equipment, including mechanical stokers, ash discharge, etc., and consume about 500 tons of coal per week.

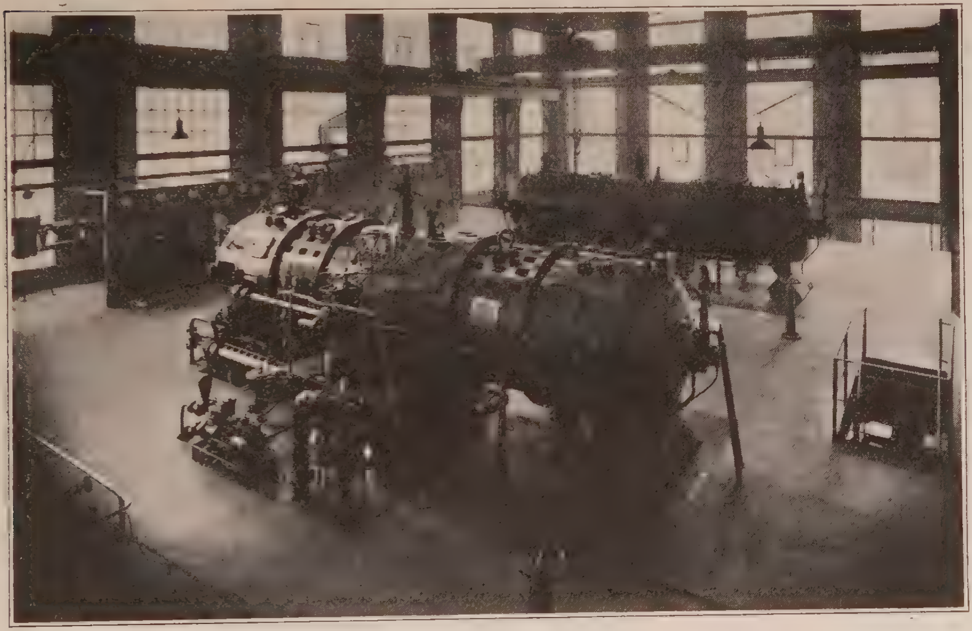
Owing to the marshy nature of the site on which the works were constructed, very heavy piling was necessary, and it is interesting to note that the works stand on over 6,000 piles varying in length from 35 to 80 feet. Concrete is, of course, the main constructional material employed in all the factory buildings. Two examples of modern concrete road construction are on view at the works. A small section joins up with the main road at the work's entrance. A more noteworthy example, however, is the road from the truck entrance to the silo loading platform over which passes a constant stream of heavy traffic. It excellently demonstrates the strength and durability of the material of which it is made.

A modern cooperage for constructing the casks in which the cement is packed for export is an interesting part of the equipment of the works. Many of the machines are of a special nature and have been patented by the company.

For the despatch of cement there is a deep water jetty giving 8 feet of water at low tide. Here two steamers of 1,600 tons can load simultaneously. There is also direct rail connection with the Southern Railway, and consequently with London, for the despatch of cement by rail.

Safety and Welfare Work

While the works has been designed and built on the most up-to-date lines and heavy manual labor reduced to a minimum by the introduction of labor-saving devices wherever practicable, the welfare of the workers themselves is not lost sight of. It is, in fact, a very important consideration in the organization of the works. "Safety First" propaganda by means of posters is employed constantly to call attention to the dangers of carelessness or indifference to personal safety engendered by familiarity. The men's comfort is provided for by a canteen where they can have their meals, a football practice pitch adjacent to the factory, etc. The latter provides some recreation during meal hours, and close to the works there is a fine football field where one or another of the works' teams is to be found nearly every Saturday afternoon (half-holiday) fighting for honors in the local league. In the evenings the younger element is to be found practicing the noble art of self-defense in the boxing ring fixed up in the canteen.



The power house. Two steam turbines operate electric generators of 3000 kilowatts capacity

This fine, modern works attracts a large number of visiting cement men from all parts of the world. The names of distinguished visitors are found in the visitors' book. Parties from various scientific and technical institutions are frequently entertained. Polytechnics and other educational establishments find a trip round the plant of great practical benefit to their young students.

For the data necessary for the preparation of the foregoing descriptions, the writer is indebted to the Associated Portland Cement Manufacturers, Ltd., London.

A Year's Experience With a Borrowed Plan

The Experiences of the Glens Falls Portland Cement Company in a Year's Campaign to Cut Down Accidents —New Interest Shown—The Bonus Plan—Favorable Results Obtained

By E. H. PARRY
Safety Director, Glens Falls Portland Cement Company, Glens Falls, N. Y.

IN this paper I have no desire to tell anyone how safety work should be done, but simply to give the experience in my own plant for the past year. It may be that our experience will be of value to others in settling their problems, for, in the last analysis of this safety work, I believe every plant is a distinct unit and differing conditions make it impossible for any rules except the very general ones to be adopted. The purpose of these congresses is for the exchange of ideas so that all of us may benefit by the experience of each of us. It is really a clearing house of safety ideas.

It was just a year ago at this Congress that I became actively identified with the safety movement. I have referred to our plan as a "borrowed" plan for it is a mixture of the ideas I received during a week's study with Mr. Jacobsen just previous to the last Congress. I feel that whatever credit is due us for the improvement we have made should go to Mr. Jacobsen, Mr. Sass of the Universal, Mr. Halpin of Marquette and Mr. McDonald of the Canada Portland. These men were kind enough to give me their ideas and I have felt perfectly free to use them as I saw fit.

We have a million and a half barrel plant that during the past three years has gone through a complete reconstruction and is now modern in every respect. We operate our own quarry situated about a quarter mile from the plant. Our entire force is about 350 men made up largely of Italian and French-Canadian labor. The plant is operated on a three shift basis throughout the year.

Previous Accident Record

The story of our accident experience for the past year would be without point unless the result of a previous period is briefly considered and comparison made between the two. In the calendar year 1925, we suffered two deaths, 38 lost time accidents resulting in a total of 892 days lost time. In a year's time we had dropped from 54th place in the severity rating to 112th place. There was an excellent chance for improvement and only a small chance to make a worse record.

Survey of Conditions

Plainly the first thing to be done was a thorough examination to determine if possible what the reason for such a record might be. On the surface there was no apparent reason. A complete safety organization was in operation, bulletins were used, warnings were posted, first-aid treatments were compulsory and yet there were accidents with appalling frequency and severity. A careful analysis of all accident records gave very little help. All departments seemed to be uniformly bad and it was not surprising that there was a feeling amounting almost to a conviction that the sacrifice of human life and limb was essential to the manufacture of cement. The only evident fact brought out by this analysis was that the human element was responsible for the great majority of the accidents. Machine accidents were very infrequent, and in that respect we were no different from other plants in the industry. Evidently the factor of "interest" was the factor that was lacking.

The month of October was spent in an analysis of all accident records, the month of November in organizing a Foreman's Committee to take hold of accident prevention, and the last month of the year in perfecting plans for an intensive campaign to begin the new year. In our first meeting together these foremen were accused of being responsible for more than 75 per cent of the accidents because of their failure to use the authority they had in the direction of accident prevention. That first meeting marks the beginning of our new program based on the personal responsibility of each foreman for the safety of each man under his jurisdiction. With the cooperation of this committee we felt sure improvement was certain, and the results show we have had the whole-hearted support of each member. We made no mistake in placing our goal too high. We knew perfection was not possible in one year, so our aim was set on a good substantial improvement.

Preparation Period

During these first three months of my "experience" very little actual safety work was done. It was a period of preparation for the year 1926. This period resulted in one death and 18 lost time accidents, thereby holding up the tradition of the industry that the last 3 months of the year are more disastrous than any other period. It was a discouraging time for a new safety director.

We began this year with the following organization. The foremen made up our central safety committee which has supervision of every angle of safety work. It was felt necessary to place authority behind the movement and these foremen gave us the most natural means of doing so. Each foreman was made personally responsible for the safe conduct of his department and safety was placed on an equal footing with production and efficient work. A mark against any one of these is a mark against the record of that foreman. This committee make their own inspections, pass on all recommendations of the safety director and act as an advisory body for the safety director. Every item of the safety work is reported to them and they are constantly in touch with affairs. I cannot too highly commend this committee for the help and support they have given me. Without this support I am perfectly confident that we could not have made the improvement we have.

The second committee is made up of representative workmen from each department and is essentially an instruction committee. Weekly meetings are held and all phases of safety work are taken up. Attendance is compulsory, a part of the men's work. The immediate good this committee does is a doubtful quantity, but each time the membership is changed each department has a man that has been instructed in accident prevention work and has had the safety idea thoroughly drilled into him. We rely on these men to help carry along the floating force that is continually changing.

Safety Competition

Our plant is divided into fourteen departments that follow as closely as possible the natural divisions of labor. A safety competition is run between these departments for periods of 3 months. At the end of each 3 months we wipe the slate clean and start fresh again. A cash award is given each man in a department that has completed the period without accidents causing loss of time. This competition began on January first and on April first we were able to reward nine of the fourteeen departments. Five were eliminated by accidents that should not have caused loss of time.

The old idea of taking a vacation for each slight accident was working. No effort was made by the personnel department to hurry these men back. In most instances when these men came back their welcome was not a cordial one. They had caused their department to lose out in the competition. One man, I recall, lasted one day and quit, another two days and a third less than two weeks. Ever since that first period a man is back on the job the morning following an accident unless there is not a doubt of his disability. Vacations are not taken that way any more. I believe that is the most valuable lesson the safety department has taught. It has effectively cut out one of the causes of our consistently poor record and is naturally reflected in our severity rating. At the present time we find our lost time accidents are serious enough to cause loss of time, and we have made our problem one step less complicated.

This first period of our competition showed up one failure of the idea. A department losing out in the beginning of a period would lose interest until the second one started. It was not thought advisable to shorten the periods, so this defect was let go. It was really a mechanical defect that could be met by close personal supervision on the part of the foreman. The second period of this competition was a complete success. There were no lost time accidents during this period and we were able to run 107 consecutive days without loss of time. Our best previous record had been 42 days. Our greatest pleasure at this record was that we had practically rid the plant of the idea that accidents were essential to the manufacture of cement. That was a victory in itself.

During the third period there was a decided reaction, apparently without cause unless it was due to the intensity of the work through the whole plant at the height of the shipping season. This third period spoiled our good record with four lost time accidents. This third period also marked the end of my year's experience on October first.

A Year's Accomplishment

For purposes of comparison I propose to take the periods, January first to October first of the years 1925 and 1926. The following figures cover these periods:

	1925	1926	Per Cent Reduction
Fatalities	1	0	100.0
Lost time accidents	29	16	44.8
Days lost time	6437	386	94.0

As I have mentioned before, the last 3 months of 1925 resulted in 1 fatality and 18 lost time accidents. The first 9 months of 1926 we show improvements of 100, 44.8 and 94 per cent over the same period of 1925. Without undue optimism I believe we will be able to increase these percentages of reduction by the results of the last period of our competition. We have our men fairly well imbued with the essential idea of safety and that is "no chance taking." Our paramount idea has been that the management does not expect or want any man to take any chance of injury. We expect to take care of the machine hazard and we expect every man to watch his own step.

From the humanitarian point of view our experience has been successful. We may say we have prevented one fatality and a considerable amount of serious and painful injuries. Any corporation in these advanced times would gladly spend any reasonable amount to prevent a fatal accident, but these advanced times also provide us with compensation laws that are extensive and it is perfectly possible to justify an intensive safety campaign from the financial viewpoint. New York state is probably the most liberal of any in its provisions for injured employees. In certain cases the maximum benefits for a fatality may reach $25,000. No other state can attain this mark at the present time. Compensation is based on two-thirds of a man's average weekly wage with a maximum rate of $20 a week. Payment is not made for the first week unless disability should extend 7 weeks. The cost of our compensation insurance for the first 6 months of 1925 amounted to approximately $13,590.49, for the same period of 1926, approximately $1748.83 or a saving of $11,841.66.

I regret that I was not able to obtain cost figures for 9 months of 1926 but the actuarial department of the State Insurance Fund is undergoing a reorganization and I have had to content myself with the figures for 6 months. The cost of our competition was $2770.00 and that amount covers the increased cost of the safety department in 1926 over 1925. Adding these figures to the incurred medical and compensation cost for 1926 we can show a saving of $9,071.66. We justify our giving a cash bonus for safety by the fact that we are taking it from our insurance fund and giving it to the men. It should not be necessary to purchase a man's safety, but there is nothing that appeals to the average working man as an increase in his pay envelope. We were anxious to get immediate results and took this means to stir up interest.

The Humanitarian Side

I do not want to convey the impression that the officials of my company base the success or failure of accident prevention work on any profit or loss result. My job was to cut down accidents and it was certainly a pleasure to justify that work from the financial viewpoint without resort to the plea of humanitarian feelings. Every safety director has an additional argument in that plea, for no one can measure the value of human life in terms of the cold dollars of our business world.

So much for the accident experience of my plant during the past year. It has been a year of work with the reward of results obtained. We are not yet able to compete with the leaders, but we expect to be there in time. We are trying to build a solid foundation so our superstructure will stand the test of time. Our leaders in the industry have made a long ladder for us to climb, but we are working on the assumption that the only thing a record is good for is to be broken. If in this calendar year we climb up a few rounds in the Association records we will consider that a recompense for our work and an incentive for further improvement.

MEN and MILLS

Notes from the Field

Ask Charter for Tennessee Plant

Mill to Be Located East of Knoxville; Capitalized at $1,750,000; Philadelphian Is the Plant Engineer

Howell J. Davis, Knoxville, Tenn., and J. Ross Hanahan, Charleston, S. C., and associates have acquired a 300-acre site east of Knoxville as the location of a $1,600,000 cement plant. Capitalization is placed at $1,750,000. A daily production of 3,000 barrels is planned.

A charter has been applied for, but the name has not yet been agreed upon. It is reported that J. Ross Hanahan will be president of the organization and Major F. H. Lewis of Philadelphia the plant engineer. Offices will be at Knoxville.

Deed to Michigan Cement Plant Is Filed

With $150,000 still owing by the state, deed to the Chelsea (Mich.) cement plant property, operated as an industry by Jackson prison, has been filed with Auditor General O. B. Fuller and promises to raise the question of the legality of the members of the prison commission issuing notes covering the amount due.

Under the original contract with the Potter estate, from which the plant was purchased for $500,000, the state was to pay $75,000 a year on the property and the deed was to be delivered upon the last payment, it is said. A $75,000 payment recently was made, and then members of the prison commission issued two notes of $75,000 each, payable in 1927 and 1928, after which the deed was delivered, it is reported.

The right of the prison commission to issue the notes is questioned in some circles. The matter never has been brought officially before the administrative board, and some legal authorities are claiming that if the members of the commission signed the notes, they, as individuals, and not the state can be held.

International Louisiana Plant Installs Kilns

Two kilns, each measuring 10 feet in diameter and 219 feet in length, are now in place at the New Orleans plant of the Louisiana Portland Cement Company, an International Cement Corporation subsidiary.

Marquette Co. Adds to Its Capital Stock

Expansion of the business of the Marquette Cement Manufacturing Company of La Salle is seen in advices showing an increase of capital stock of $3,000,000. The former capital of $7,000,000 was increased to $10,000,000 and certified by Louis L. Emmerson, secretary of state.

The company operates two plants, one at Oglesby and the other at Cape Girardeau, Mo. The increased capital stock meets the demands of the Missouri plant, where one of the most modern cement mills in the Middle West is now operating, many improvements in the past having taken place and others being contemplated.

Plant Projected for New Valley Forge Cement Co.

West Conshohocken, Pa., Planned as Site of New Mill Designed by MacDonald Engineering Company

The Valley Forge Cement Company has been organized and will be located at West Conshohocken, Pa., it is reported.

The plant, on which construction will begin shortly, will use the wet process. J. W. Fuller is at the head of the organization, and the MacDonald Engineering Company, Chicago, has been selected as the engineer.

The first unit of the plant to be built will have a capacity of approximately 2,600 barrels of cement daily. It is expected to start operation in July of this year.

Power Equipment Changed in Coplay Plant

The plant of the Coplay Cement Manufacturing Company, Coplay, Pa., was closed for several days during January to permit engineers to change the motive power equipment from 25-cycle to 60-cycle electrical energy. A large force of electricians has been engaged for six months in making the change, which involves new wiring and more than a hundred new motors. The company's new transformer building will be put into full operation.

Dixie Cement Association Establishes Headquarters

The headquarters of the Dixie Cement Association of Northampton County, Pa., have been established at the plant of the Penn-Dixie Cement Corp., near Bath, Pa., in a new all-concrete and steel three-story office building. Additions, however, are already necessary and are to be made in the early spring.

Initial Shipment of Cement By Air Made

A "cement by air" movement was commenced by the International Cement Corporation recently when a bag of Lone Star cement was shipped by airplane from its subsidiary, the Virginia Portland Cement Corporation, at Norfolk, Virginia, to E. L. Conwell and Company, testing engineers, of Philadelphia.

Sun and Oregon Portland Companies Merge

The Sun Portland Cement Company, at Lime, Oregon, has been merged with the Oregon Portland Cement Company, according to an announcement. The latter name will be used. Offices will be maintained at 1104 Wilcox Building, Portland.

The new company will maintain and extend the service rendered by the absorbed company and will supply the trade with either Oregon or Sun brands. No change in personnel was contemplated, it was said.

Plant Closes; Workers Busy On Construction Jobs

Despite the fact that the Lehigh Portland Cement Company plant at Iola, Kansas, has been closed for the winter, the majority of the employes will continue working. Construction work will keep them busy until spring orders justify reopening of the plant.

Work on Keystone Plant to Start in Spring

Officials of the new Keystone Cement Company at Bath, Pa., are making plans to begin construction of the plant in the early spring, according to reports. A highly modern two million-dollar plant is contemplated.

A kindly Providence protected the babe shown with its parents when the hurricane of last October struck Cuba. The child was then two days old. Of forty employees' bungalows erected by the Cuban Portland Cement Corporation at Cayo Mason, Province of Pinar del Rio, this was the only one that emerged undamaged. It is of portland cement stucco construction on metal lath and wood sheathing, with a tile floor finish

Two Cement Plants Finish Year Without a Single Accident, Report

Three hundred and fifty men at the Mitchell, Ind., plant of the Lehigh Portland Cement Company and 200 at the Winnipeg plant of the Canada Portland Cement Company, Ltd., went through the year 1926 without a single time-lost accident, according to W. M. Kinney, General Manager of the Portland Cement Association.

By making this record, each plant will be awarded a concrete trophy which carries the thought, "Safety Follows Wisdom," and which is cast from a design created at the Art Institute of Chicago. These trophies will be presented to representatives of each plant at the spring meeting of the association. The representatives will be chosen by the workmen. After the formal presentation, the trophies will be erected in the yards of the winning plants.

An annual contest for this award which is sponsored by the Portland Cement Association is open to all plants operated by member companies. In 1926, 129 plants in the United States, Canada and South America, were entered in it. The plant which has the best safety record of the year wins the award. As two plants had perfect records during 1926, each will receive a trophy.

Although complete figures are not yet available, preliminary data indicate that fewer accidents occurred in cement mills in 1926 than in 1925, which was the banner year, up to that time. "In October of 1925, 253 time-lost accidents and nine fatalities were registered among the 40,000 workmen in cement mills," said Mr. Kinney. "In the same month of 1926, there were three fatalities and 143 time-lost accidents. This is a remarkable record, since October is the 'Jonah' month of the industry.

This is the second consecutive year in which two plants have been awarded trophies. The Port Colborne plant of the Canada Portland Cement Company and the Duluth plant of the Universal Portland Cement Company each went through the entire year of 1925 and through the first half of 1926 without a single time-lost accident.

Sun Portland Entertains Its Employees

The Sun-Portland Cement Company, at Lime, Oregon, distributed paid insurance policies of $1,000 to each of its year-old employees, as well as Yuletide checks. Children of employees were each presented with gifts. The company later was host at an opera at Hungton, followed by a ball and supper.

Southern California Cement Manufacturers Optimistic

The portland cement manufacturers of Southern California are unanimously of the opinion that the year 1927 will see a demand for cement which will exceed any of former years.

George A. Christ of Coplay Cement Mfg. Co. Dies

George Arthur Christ, secretary and treasurer of the Coplay Cement Manufacturing Company, died at his home in Coplay, Pa., on December 28. He is survived by his widow, one son, two brothers and a sister.

Seattle City Official Asks Use of Foreign Cement Be Discontinued

George W. Roberge, superintendent of the building department, has asked the aid of the Seattle, Washington, City Council public safety committee in his attempt to enforce exclusive use of domestic cement in concrete construction in Seattle.

Mr. Roberge recommended for passing a bill before the committee providing strict packing regulations for imported cement. The bill was taken under advisement by the committee after it heard a lengthy controversy between Mr. Roberge and representatives of cement importers.

The building superintendent told the committee he objected to imported cement because much of it was put through a reconditioning process after it became hardened by standing on the wharves.

Mr. Roberge pointed out that there exists a provision in the building code prohibiting the use of reconditioned cement.

"Would you agree not to handle any reconditioned cement?" one of the committee members asked the importers' delegation.

"Yes," the spokesman replied, "but let the people who handle domestic cement agree to it also."

No action will be taken on the bill unless a member of the council requests that it be brought out of committee.

Monolith Presents Elaborate Portfolios to Architects

The desire to express to the architects of the Pacific Coast its appreciation of their interest has led the Monolith Portland Cement Company, of Los Angeles, to present to approximately 1,000 architects of that region a looseleaf portfolio containing 144 plates, showing reproductions of photographs of architectural details taken in Spain and along the Mediterranean Sea. The photographs were taken by Richard S. Requa, Western architect and expert photographer. Mr. Requa was commissioned by the Monolith company to make a trip abroad last spring and to take the series of photographs which are reproduced in the portfolio.

Blasting at Plant Spreads Rumor of Earth Tremor

The explosion of two and one-half tons of dynamite at one time at the Sandusky Cement Company's plant east of Dixon, Illinois, started rumor of an earth tremor. The report brought forth many inquiries but no tremor was recorded in that part of the world at that hour.

Twenty holes, with 250 pounds of dynamite in each hole, were shot at the same time that evening and the condition of the atmosphere increased the shock.

Cement Shipments Increase Predicted for Northwest

A total of 4,328 cars of cement are expected to be loaded in the Northwest territory during the first quarter of 1927. This is the consensus of opinion of the industry in this district as reported to the Pacific Northwest Advisory Board at its meeting held December 15 in Seattle. The board is composed of representatives of all rail transportation lines in this section and of the principal industrial, financial, business, and growers' organizations. The report for the cement industry was made by Gordon Tongue, treasurer and sales manager of the Superior Portland Cement, Inc., of Seattle, who is commodity vice-chairman of the board, representing the cement and concrete products division.

The activity of the Northwest industry has been lower than for the coast as a whole, it is reported by Mr. Tongue. A portion of the decline can be attributed to fewer large contracts, he states, but a large part is due to continued heavy importations of European cement.

From August, 1923, to October, 1926, there was brought into the customs districts of Washington and Oregon approximately 756,000 barrels of European cement, Mr. Tongue points out. By far the greatest portion of the imports enter duty free, he declares. The record for the two states follows:

	Oregon Bbl.	Wash. Bbl.	Total Bbl.
1923	111,513	21,560	133,073
1924	34,094	126,512	160,606
1925	116,010	169,411	285,421
1926 (to Oct. 1)	64,392	113,009	177,401
	326,009	430,492	756,501

The loss to Northwest industry through the use of the imported product during four years totals over $1,800,000. Coal mines and oil companies lost the sale of nearly $400,000 worth of fuel. It would take the largest cement plant in this territory five and a half months to produce the quantity of cement imported in that period, Mr. Tongue points out in his report. Carrying this comparison further, he shows:

Freight on fuel, to make 756,000 barrels of cement, would be $80,000; on gypsum, $20,000. Minimum freight on the cement itself to destination would have been $250,000. This makes a freight loss of $350,000, to say nothing of thousands of dollars on incidentals.

Phoenix Man Goes to New Birmingham Plant

Warren Seigfried, of the Phoenix Cement Company and formerly at Nazareth, Pennsylvania, has removed to Birmingham, Ala., where he will take charge of the new cement plant now being erected there.

Large Portion 1927 Output For Roads, Report

According to the sales manager of one of the leading portland cement companies of Southern California, fully half of the production of the Southern California mills for the year 1927 already has been contracted for. Most of this cement will be used in completing the immense road program for the part of the state, which is now under way. More than 8,000,000 square miles of concrete roadway are provided for, making Southern California the second largest road building section of the country, it being exceeded in projected highway construction by New York State alone.

Norblo System Installed by Southern Cement

The Southern Cement Company, Birmingham, Ala., has begun operating a dust-collecting system, which, it is said, completely solves the problem of recovering cement dust and sand from kilns and dryers. At the same time the new system gives an exceptionally high recovery of over 99 per cent.

The hot dust and gases first pass through a separator, which recovers about 60 per cent and the remaining 40 per cent passes into a tank, where it is mixed with atomized spray and is then precipitated as sludge. The entire equipment was installed by the Northern Blower Company of Cleveland, Ohio.

Kansas Cement Mills Protest Freight Rates

Freight rates on cement from Kansas mills to points in Missouri are being protested by the Kansas producers on the grounds that rates enjoyed by Missouri mills for the shipment of their cement to points in Missouri are lower than the Kansas rates, thus shutting out the product of the Kansas mills. The Kansas shippers have shown that the Missouri rates are from one to two cents lower than the Kansas rates for shipment to the same territory. Adjustment is being asked upon the grounds that the rates are unduly preferential and unreasonable. Harry C. Ames was the examiner for the interstate commerce commission at the hearing, J. H. Porter represented the Missouri commission, and Morris D. Roberts appeared for the carriers.

Directors of the Giant Portland Cement Company at the December 15 meeting voted to pay the back dividends on its stock amounting to 19 per cent, in addition to declaring the regular semi-annual dividend of 3½ per cent. The total payment will be $11.25, par being $50.

British Cement Plant to Enlarge

The increasing demand for cement was well told at a general meeting of Eastwood's Cement, Ltd., recently held in London, when the question of increasing the capital was mooted and a resolution in favor of doing so passed.

The chairman, Horace Boot, M. I. C. E., M. I. Mech. Eng., M. I. E. E., said: "When I last had the pleasure of addressing you in September of this year, I hinted that your directors were already considering the advisability of extending the works, and that the consulting engineers, when designing the plant at present installed, had made provision for extension, so that the further capital outlay required to double the capacity of the plant would be a minimum.

"You directors had therefore to consider, first, whether this additional plant would delay the dividend-earning period of the present plant; secondly, if it would reduce the cost of manufacture, and, thirdly, whether there was reasonable belief that there would be the demand for the products, and lastly, if there would be any difficulty in raising the necessary capital."

With regard to the demand, the amount of cement used in Great Britain during 1925 was 220,000 tons more than in 1924. The mileage of concrete roads in this country is only approximately 250, whereas the total mileage in which concrete will probably be used is over 150,000. Reinforced concrete and all kinds of cement products are now being made in ever-increasing quantities.

The original valuation on the basis of a 50,000-ton plant being installed was £45,400 ($227,000), and the purchase price paid by the company was £20,000 ($100,000).

The directors offered the new £1 ($5) shares at 25s ($6.25), in the proportion of one new share to every three fully paid old ones, which provided a handsome Christmas bonus, since the market price is now about 31s3d ($7.80).

Writer Cites Cement Industry as Example

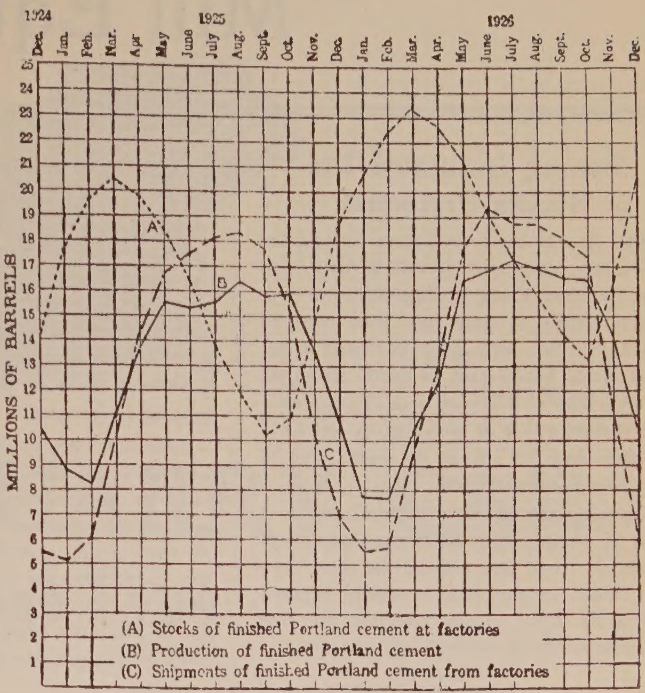
In a recent article published nationally by B. C. Forbes, writer and publisher, the cement industry was quoted as an excellent example to follow in bringing about increased use of a product. He described the work of the Portland Cement Association and its method of functioning.

In closing, he said, "The net result is, of course, that the use of cement has multiplied manifold since the organization was formed. It was this association which made you and me "cement conscious"—and gave us concrete roads to ride over.

Cement Statistics for December

PRODUCTION of portland cement in December, 1926, shows a slight increase, and shipments show a decrease of 7 per cent, as compared with December, 1925. Portland cement stocks at the end of 1926 were 11 per cent higher than at the end of 1925.

These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for December, 1926, received direct from all manufacturing plants except two, for which estimates were necessary on account of lack of returns.



Estimated Clinker (Unground Cement) at the Mills at End of Each Month, 1925 and 1926

(Figures Represent Barrels)

Month	1925	1926*
January	7,017,000	9,074,000
February	8,497,000	10,931,000
March	9,962,000	12,290,000
April	9,731,000	12,967,000
May	9,053,000	11,695,000
June	7,937,000	10,144,000
July	6,961,000	8,604,000
August	5,640,000	7,362,000
September	4,561,000	6,112,000
October	4,086,000	5,370,000
November	5,013,000	5,748,000
December	6,469,000	7,645,000

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*Revised.

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1925 and 1926

(Figures Represent Barrels)

Month	Production 1925	Production 1926*	Shipments 1925	Shipments 1926*	Stocks at end of month 1925	Stocks at end of month 1926*
January	8,856,000	7,887,000	5,162,000	5,674,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,689,000	22,385,000
March	11,034,000	10,390,000	10,279,000	9,539,000	20,469,000	23,236,000
First quarter	28,145,000	26,008,000	21,456,000	21,033,000		
April	13,807,000	12,440,000	14,394,000	12,965,000	19,877,000	22,710,000
May	15,503,000	16,510,000	16,735,000	17,973,000	18,440,000	21,255,000
June	15,387,000	16,866,000	17,501,000	19,134,000	16,409,000	19,000,000
Second quarter	44,697,000	45,816,000	48,630,000	50,072,000		
July	15,641,000	17,134,000	18,131,000	18,812,000	13,896,000	17,301,000
August	16,419,000	16,995,000	18,383,000	18,583,000	11,952,000	15,718,000
September	15,939,000	16,571,000	17,711,000	18,087,000	10,247,000	14,188,000
Third quarter	47,999,000	50,700,000	54,225,000	55,482,000		
October	15,992,000	16,596,000	15,309,000	17,486,000	10,979,000	13,334,000
November	13,656,000	14,193,000	10,187,000	11,276,000	14,534,000	16,243,000
December	10,713,000	10,744,000	6,917,000	6,432,000	18,515,000	20,555,000
Fourth quarter	40,361,000	41,533,000	32,413,000	35,194,000		
Preliminary total	161,202,000	164,057,000	156,724,000	161,781,000		
Amount of underestimate	457,000		571,000			
Final total	161,659,000		157,295,000			

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*Revised.

Commercial District	December Production 1925	December Production 1926	December Shipments 1925	December Shipments 1926	Stocks, End of Dec. 1925	Stocks, End of Dec. 1926	Stocks, End of Nov. 1926*
Eastern Pennsylvania, N. J., and Md.	3,053,000	2,875,000	1,908,000	1,582,000	2,534,000	3,990,000	2,697,000
New York	710,000	634,000	352,000	233,000	1,028,000	1,284,000	883,000
Ohio, Western Pa., and West Virginia	955,000	851,000	545,000	543,000	2,314,000	2,460,000	2,151,000
Michigan	904,000	741,000	309,000	330,000	1,923,000	1,897,000	1,486,000
Wisconsin, Illinois, Indiana, and Kentucky	1,257,000	1,530,000	632,000	632,000	3,510,000	2,982,000	2,084,000
Virginia, Tennessee, Alabama, Georgia	942,000	1,022,000	813,000	951,000	949,000	1,195,000	1,124,000
Eastern Missouri, Iowa, Minn., and S. D	759,000	904,000	357,000	234,000	2,831,000	2,937,000	2,317,000
Western Mo., Nebraska, Kansas, Oklahoma	512,000	603,000	438,000	330,000	1,657,000	1,761,000	1,538,000
Texas	393,000	379,000	342,000	316,000	479,000	444,000	381,000
Colorado, Montana and Utah	49,000	87,000	85,000	69,000	415,000	471,000	454,000
California	971,000	981,000	1,016,000	978,000	491,000	665,000	662,000
Oregon and Washington	208,000	137,000	120,000	134,000	384,000	469,000	466,000
Total	10,713,000	10,744,000	6,917,000	6,432,000	18,515,000	20,555,000	16,243,000

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*Revised

Mill Equipment

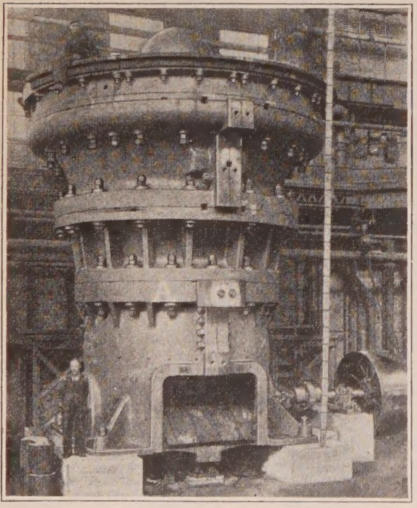
Beaver Adjutable Die Stocks Perfected

The No. 70 series of Beaver adjustable die stocks, developed by the Borden Company, Warren, Ohio, is adapted to use with power drives because the dies may be quickly thrown open after the thread is cut, thus saving backing off by hand. Each tool threads several different sizes of pipe without changing dies or bushings, or left hand threads may be cut in the same tool by inserting left hand dies.

Unlike some stocks, the die adjusting cam is beneath the dies, eliminating obstruction above and around the dies. The full width of the dies is openly exposed above the body of the tool for the free application of oil directly onto the dies.

Largest Ore Crushers Shipped to Chile

Two crushers weighing a million pounds each and said to be the largest in the world were designed and built for the Chile Exploration Company, a subsidiary of the Anaconda Copper Mining Company, for installation at Chuquicamata in the Andes Mountains in Chile. They are now being shipped from the West Allis (Wis.) works of the manufacturer.



Because of the hardness of the copper ore which they must handle the crushers are of an especially heavy design, built almost entirely of steel, the castings and forgings being among the largest ever made in this country.

Two hopper openings each 5 feet across permit a carload of ore weighing 70 tons to be dumped into the crusher at one time. Some pieces of the ore will weigh as much as seven tons. This will be reduced to a 12-inch product; each crusher handling from 2,000 to 2,500 tons of ore per hour.

Shipment will be made by rail to New York, 25 freight cars being required to handle the two crushers and spare parts.

New Rotating Cam Type Limit Switch

The Electric Controller and Manufacturing Company, of Cleveland, Ohio, announce a new rotating cam limit switch to be used with magnetic controllers for the automatic control of machines having such fixed sequence of operation as slowing down, stopping and reversing.

This cam type limit switch is totally enclosed, is equipped with tapered roller bearings and is designed to carry up to six sets of contacts. The cams which operate the opening and closing of the contacts are each adjusted independently of the others and can be fixed at an infinite number of positions, thus giving extreme flexibility to the machine with which it is used.

At the Power Show

Tracyfier at Power Show

The *Andrews-Bradshaw Company Tracyfier* exhibit at the Chicago Power Show will include a section of a boiler drum with the Tracyfier installed. The drum will have plate glass ends. The action of the Tracyfier, breaking up foam and supplying clean, dry steam to a foaming boiler, can be clearly seen.

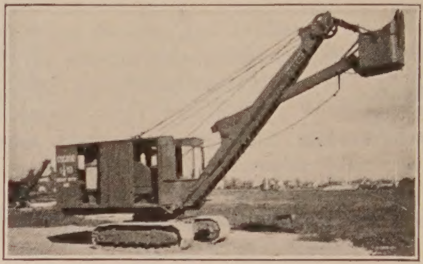
New Air Filter System at Power Show

The new American blower air filter was exhibited for the first time at the American Blower Company booth at the New York Power Show, held in New York City in December.

With the use of this equipment, dust-laden air is divided into a series of small jets which strike the flat filament coated surface of the plates, dust and soot are projected against the filament, seized and retained. The air, changing its direction and rebounding from this surface flows through to the next plate and is carried through ten successive dust removal operations of this type. The device does not require oil or other adhesives, and maintains a constant effect and efficiency.

Osgood Builds New 1¼-Yd. Gas and Electric Shovel

Guided by the demand for large gasoline and electric shovels, the Osgood Company, Marion, Ohio, has designed a 1¼-yd. gasoline or electric machine designed for service as a crane, with hook block or clamshell bucket, and as a dragline excavator, without necessitating any changes or additions to operating machinery, outside of the booms and buckets.



Only four friction clutches are used in the usual operation of the machine. These are of the outside contracting band type.

Wet and Dry Process Aids Dust Elimination

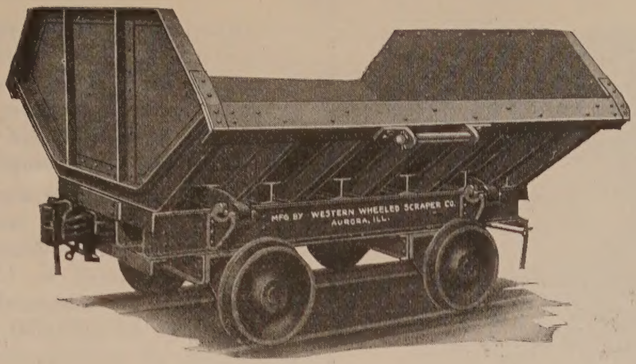
A novel combination of the wet and dry process dust collecting systems which is stated to overcome the difficulties generally met with in the recovery of hot gases and dust from dryers, kilns, etc., and in the operation of coal-crushers, has been effected by the Northern Blower Company, Cleveland, Ohio.

The present installation uses both a dry process cyclone collector and a wet process spray chamber. The greater part of the dust is therefore recovered in a dry form, ready for immediate utilization, and the comparatively small remainder is converted into sludge. The elimination of dust-nuisance is thus accomplished with a minimum of loss of usable material.

The method described has also considerable advantages when applied to coal crushers and dryers, for it effectively prevents the risk of explosion generally present where fine coal dust is handled, and at the same time it permits the coarser grains to be fed to the furnaces without preliminary drying.

New Pumps

The Dunning Pump and Manufacturing Company, Philadelphia, Pennsylvania, has added a new 3" bore 3" stroke two cylinder pump to their other sizes of pumps.



WESTERN QUARRY CAR

Side-Hinge Type

Low Loading Height

To meet a demand for a quarry car of great strength, low loading height and without locking mechanism, we have designed a steel car of the side-hinge type and of great strength, which in material and workmanship conforms to the well-known Western standards of construction.

Inside bearings have been provided to avoid all damage to the journal boxes.

Unrestricted Opening

A glance at the illustration will show the low loading height and the absence of side doors, giving an unrestricted opening. Rock of any size can be dumped and the great strength of the car permits the handling of any rock that can be loaded.

The car is dumped at the crusher by means of a power hoist, which can be operated either electrically or by air.

This car is made in 6-yard, 8-yard and 10-yard sizes, and will be found satisfactory for the purposes intended.

1877 Western 1927

Western Wheeled Scraper Company

Founded 1877

Builders of Dump Cars and Earth and Stone Handling Equipment

AURORA, ILLINOIS

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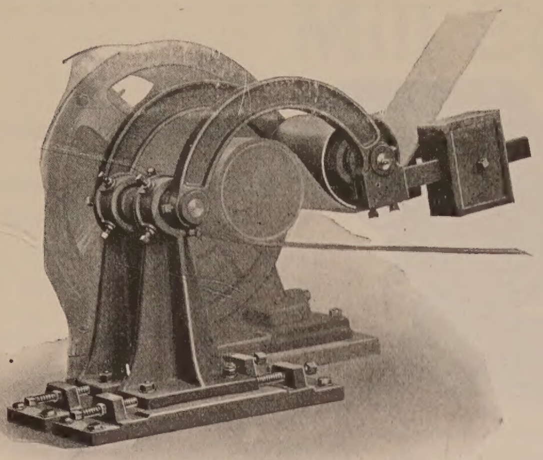
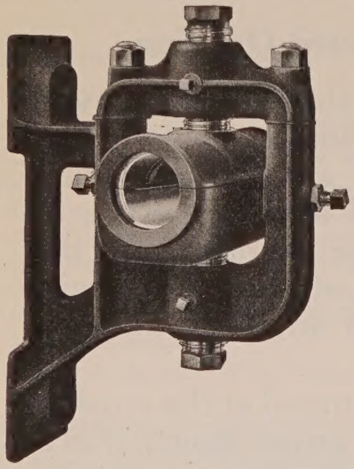


Another Way to Great Savings—
"We Have Just Ordered Another"!

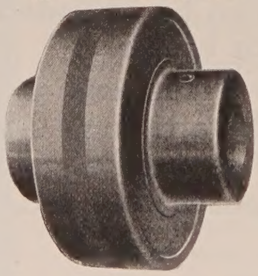
Wherever the U. G. Belt Contactor is in use it lives up to its promises of economical performance. It eliminates the usually present difficulties experienced with long belt drives along with the waste and wear and loss of power.

Read what the Union Mining Co., Mt. Savage, Md., says regarding this efficient little power transmission unit:

"This drive is giving us such wonderfully good service that we have just placed an order with you for a second contactor, which we hope will work out as well as the one now in use."



Because its adaptability to many and varied industries has been proven, and because of the commendation of its users, we say the U. G. Short Center Belt Contactor will save for you, too.



Power Belts
and Floor Space

T. B. Wood Sons Co.
Chambersburg, Pa.

NEW ENGLAND BRANCH:
Cambridge, Mass.

SOUTHERN BRANCH:
Greenville, S.C.

Makers of Power Transmission Machinery Since 1857

BY INVITATION MEMBER OF
NEW YORK, U.S.A.

California State Mining Bureau Reports

California's mineral output in 1925 was valued at $434,519,660, as compared with a mineral production valued at $374,620,789 the year previous, or an increase in production of 15.9 per cent, according to figures embraced in the California State Mining Bureau's report, which has just been completed and issued.

Although petroleum accounted for $330,609,829 of the 1925 values—73.7 per cent of the total—cement ranked second in the year's mineral values. Barrels of cement produced amounted to 13,206,630, with a valuation of $25,043,335, as compared to 11,655,131 barrels with a valuation of $23,225,850 produced in 1924. The year's production of miscellaneous stone, consisting largely of road-building materials, macadam, sand, gravel, and so on, were third in the list of values with a total of $17,409,854, an increase of $1,473,474 over the previous year.

The largest percentage increase in quantity and value over 1924 was made by gypsum, which rose from 25,569 tons, valued at $53,210, to 107,613 tons, valued at $172,444. In quantity, the increase was 320 per cent, and in value 224 per cent. Gypsum is utilized mainly as a retardant in the manufacture of cement, for wall board, hard wall plaster, stucco, and for fertilizer. The increased production last year was due to the larger scale of operations of the Pacific Portland Cement Company's gypsum plant in western Imperial County. Besides the Imperial County deposits, which are said to contain an inexhaustible supply, the only known commercially workable sources of gypsum in the state are in Riverside County.

Lime was produced to the extent of 61,922 tons with a valuation of $685,528, as compared to a production of 62,092 tons valued at $703,355 in 1924. Magnesite yielded 64,623 tons valued at $872,944, while 67,236 tons valued at $900,183 were produced the year previous.

Continue Tests on Action of Elements Upon Gypsum

Washington, D. C.—Gypsum, although satisfactory as a plaster and tile for interior work, has not proven satisfactory for exterior construction because of its slight solubility in water. The Bureau of Standards initiated an investigation about three and one-half years ago with the purpose of increasing the weather resistance of gypsum. At present there are approximately 150 treated cylinders and 32 treated panels being exposed to the weather. Several cylinders and panels show promise of good results. As new methods of treatment or new compounds come to the Bureau's attention, cylinders are made and exposed for observation. Examination is made from time to time, with the expectation that, eventually, a means will be found for improving gypsum in this respect, thus opening immediately a new market for this material.

International Testing Materials Congress Planned

In accordance with a resolution passed at a meeting of representatives of associations for testing materials of 17 countries in September, 1926, at Zurich, Switzerland, plans are being made for the first International Congress for Testing Materials. This meeting will be held at Amsterdam, Holland, September 12 to 17, 1927.

A committee of the Dutch association, headed by P. F. Van Der Wallen, assisted by members of the Swiss association, is in charge of the coming congress.